

SUMMARY OF DIRECT CONSTRUCTION COST

Table C-23

Work Items	No. of Project	No. 1		No. 2		No. 3		No. 4		No. 5		No. 6		No. 7		No. 8		No. 9		No. 10			
		Unit	Vol.	Cost	Unit	Vol.	Cost	Unit	Vol.	Cost	Unit	Vol.	Cost	Unit	Vol.	Cost	Unit	Vol.	Cost	Unit	Vol.	Cost	
I. Land Acquisition and Compensation																							
Residence/Productive area	ha	3.6	600	5,060.0	114	410.4	708.2	1,299.0	126	433.6	651	2,343.6	50	180.0	173	622.8	136	489.6	140	504.0	305	1,098.0	
Non productive area	ha	1.1	0	0.0	22	24.2	70	77.0	230	253.0	1,206	1,326.6	35	38.5	96	11.0	10	11.0	52	57.2	0	0.0	
Houses	nos	1.2	1,200	1,440.0	228	273.6	0	0.0	252	302.4	1,302	1,562.4	100	120.0	346	415.2	272	326.4	280	336.2	610	732.0	
Land for Flood Dike				1,469.0		1,222.0		474.0		303.0		80.0				638.0		329.0		486.0			
II. Inmate Facilities	L.S.	4	10,504.0	0	0.0	0	0.0	1	2,000.0	1	4,205.0	0	0.0	0	0.0	1	2,336.0	1	2,803.0	1	2,803.0	1	2,700.0
III. Irrigation system																							
3.1 Main Canal																							
New	km	146	50	7,900.0	0	0.0	0	0.0	31.5	4,599.0	57	8,322.0	0	0.0	14.5	2,117.0	10	1,460.0	19.5	2,847.0	11	1,606.0	
Structures				3,212.0		0.0		2,023.0		3,661.7		0.0		0.0		921.5		642.4		1,252.7		706.6	
Rehabilitation	km	73	36.7	2,679.0	0.0	0.0	0.0	0.0	0.9	62.1	1.2	87.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Structures				1,178.8		0.0		27.3		38.5		0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
3.2 Secondary Canal																							
Earth work	km	97	318.8	30,923.6	0.0	0.0	0.0	0.0	184.1	17,857.7	71.5	69,355.0	0.0	0.0	132.2	12,823.4	74.9	7,265.3	101.3	9,326.1	165.7	16,072.9	
Structures				10,514.0		0.0		6,071.6		23,580.7		0.0		0.0		4,360.0		2,470.2		3,340.9		5,464.8	
IV. Drainage System																							
4.1 Main Drain																							
New	km	70	33	2,310.0	24	1,680.0	15	1,050.0	15.5	1,085.0	72	5,040.0	25	1,750.0	9	650.0	15	1,050.0	18.5	1,295.0	15	1,050.0	
Structures				785.4		571.2		357.0		368.9		1,713.6		595.0		214.2		357.0		440.3		357.0	
Rehabilitation	km	35	10	350.0	7	245.0	0	0.0	12	420.0	24	840.0	0	0.0	8	280.0	0	0.0	15	525.0	23.8	833.0	
Structures				119.0		83.3		0.0		142.8		285.6		0.0		95.2		0.0		178.5		283.2	
4.2 Secondary Drain																							
Earth work	km	70	212	14,819.0	113	7,903.0	55	3,850.0	123.2	8,624.0	1,040	72,800.0	60	4,200.0	69.1	4,837.0	46	3,220.0	52.8	3,696.0	113.4	7,938.0	
Structures				5,038.5		2,687.0		1,309.0		2,922.2		24,732.0		1,428.0		1,644.6		1,094.8		1,256.6		2,698.9	
4.3 Drainage Gate																							
Control Drainage Gate	nos	52.5	0	0.0	3	157.5	0	0.0	0	0.0	5	262.5	2	105.0	0	0.0	3	157.5	3	157.5	0	0.0	
Flood Gate	nos	40.5	1	40.5	0	0.0	0	0.0	2	81.0	5	202.5	1	40.5	2	81.0	0	0.0	1	40.5	0	0.0	
V. Tertiary System Development																							
On-farm Development	ha	1.2	13,222.0	15,856.4	5,755.0	6,906.0	2,800.0	3,360.0	6,185.0	7,422.0	45,470.0	54,564.0	4,320.0	5,184.0	4,190.0	5,028.0	2,425.0	2,910.0	3,450.0	4,140.0	7,038.0	8,450.4	
Land Reclamation	ha	0.3	1,065.0	319.5	1,715.0	514.5	2,800.0	840.0	4,015.0	1,204.5	29,540.0	8,862.0	2,256.0	676.8	1,486.0	445.8	385.0	115.5	1,060.0	315.0	16.0	4.8	
VI. Flood protection Work	km	L.S.	56	30,562.0	0	0.0	29	5,791.0	35	11,500.0	15	8,231.0	7	3,218.0	29	6,778.0	12	3,378.0	17	7,137.0	0	0.0	
VII. Other work																							
Forest clearing		2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	158,497	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Road											32,500	65,000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		

Table C-24(1/2) LIST OF BENCH MARK NETWORK (Silau-Bunut Area)

(The coordinates are in Zone47 of Universal Transverse Mercator grid system.  
The elevation are above mean sea level at Bagan Asahan.)

Code	X (m)	Y (m)	H (m)	Remarks
T 1202	566,484.430	328,447.200	43.784	Existing point
PUW 12	585,481.756	325,928.258	2.768	Established in 1984
PUW 17	580,269.903	328,420.522	5.892	"
PUW 18	575,633.409	324,340.436	11.076	"
PUW 19	573,006.550	327,314.477	13.231	"
PUW 30	565,573.797	333,127.598	18.760	Established in 1989
PUW 31	566,388.024	337,696.980	13.264	"
PUW 32	562,785.113	342,130.445	11.075	"
PUW 33	562,232.266	345,177.369	7.367	"
PUW 34	565,596.140	348,723.058	2.385	"
PUW 35	568,824.603	349,154.054	2.392	"
PUW 36	572,014.897	349,566.329	2.123	"
PUW 37	571,866.860	342,591.270	6.326	"
PUW 38	568,588.185	344,104.574	4.566	"
PUW 39	568,299.268	337,612.961	10.841	"
PUW 40	571,978.972	336,612.961	10.198	"
PUW 41	575,083.405	348,221.187	2.599	"
PUW 42	578,737.038	342,056.874	3.514	"
PUW 43	581,060.944	336,748.735	3.221	"
PUW 44	575,780.663	337,151.230	9.103	"
PUW 45	571,630.427	330,749.656	15.002	"
PUW 46	575,402.700	331,180.058	11.833	"
PUW 47	578,568.470	331,046.902	7.355	"
PUW 48	580,927.089	330,936.783	6.197	"
PUW 49	584,745.858	330,679.349	2.144	"
PUW 50	587,864.895	329,103.684	30.160	"
PUW 51	588,157.075	327,086.017	2.302	"
PUW 52	581,518.861	325,207.138	4.255	"
PUW 53	575,019.763	327,888.008	10.891	"
PUW 54	569,581.104	328,710.496	19.411	"

Table C-24(2/2) LIST OF BENCH MARK NETWORK (Silau-Bunut Area)

(The elevation are above mean sea level at Bagan Asahan)

Code	Distance (km)	Elevation (m)	Remarks
PUW 15	3.6	2.805	Established in 1984
PUB 1	6.9	2.119	Established in 1989
PUB 2	3.6	2.591	"
PUB 3	4.9	2.419	"
PUB 4	5.0	3.348	"
PUB 5	3.6	2.829	"
PUB 6	3.5	2.347	"
PUB 7	3.1	2.692	"
PUB 8	3.3	2.835	"
PUB 9	3.8	2.317	"
PUB 10	4.7	2.933	"
PUB 11	4.4	2.954	"
PUB 12	3.7	2.693	"
PUB 13	6.6	3.820	"
PUB 14	3.3	4.018	"
PUB 15	3.2	3.656	"
PUB 16	3.8	3.024	"
PUB 17	4.2	3.586	"
PUB 18	5.8	2.993	"
PUB 19	4.9	4.869	"
PUB 20	3.3	7.334	"
PUB 21	2.7	11.195	"
PUB 22	4.3	12.881	"
PUB 23	4.5	20.620	"
PUB 24	5.3	26.028	"
PUB 25	4.3	20.813	"
PUB 26	4.0	26.100	"
PUB 27		32.594	Established in 1984

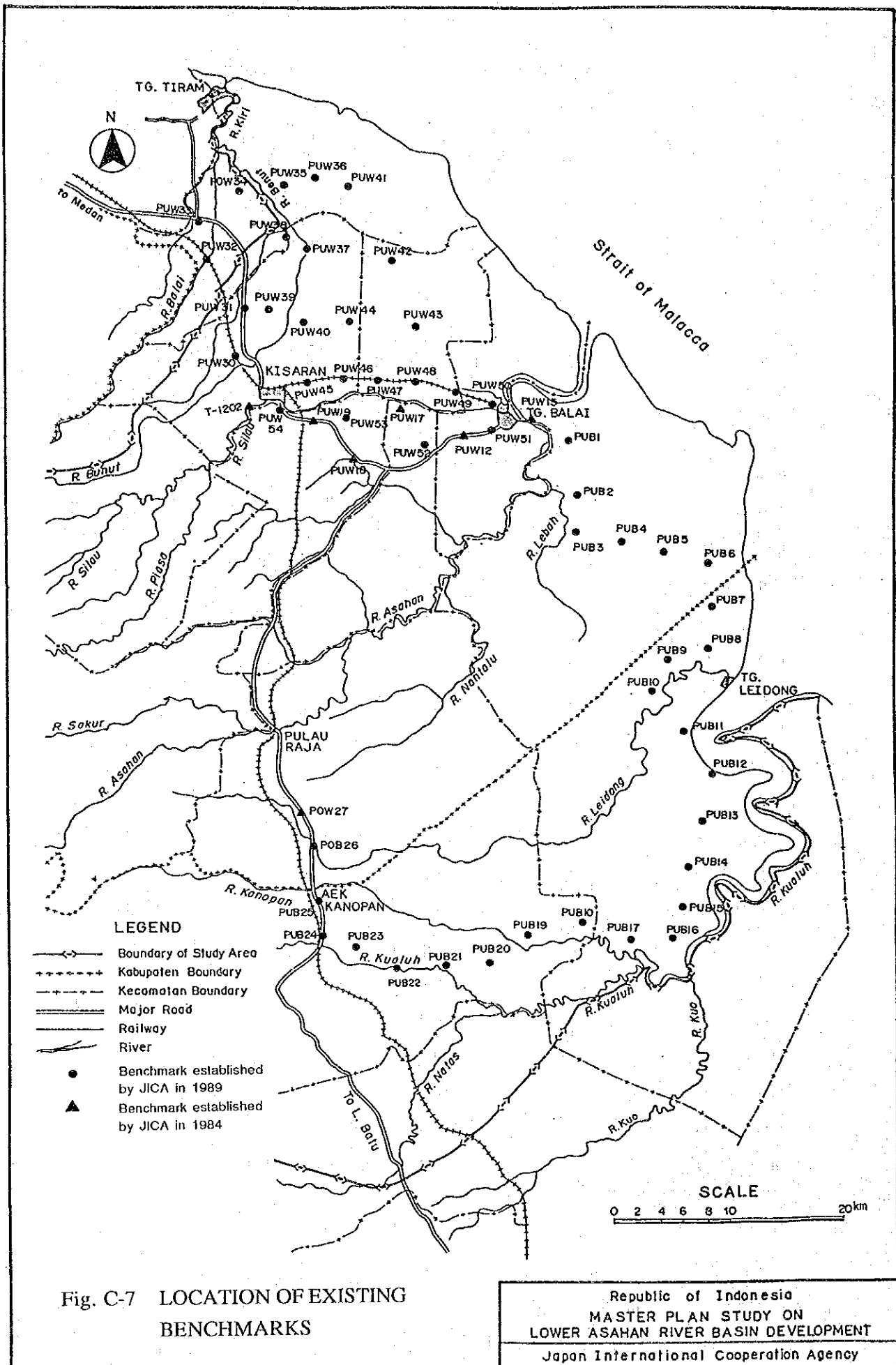


Fig. C-7 LOCATION OF EXISTING BENCHMARKS

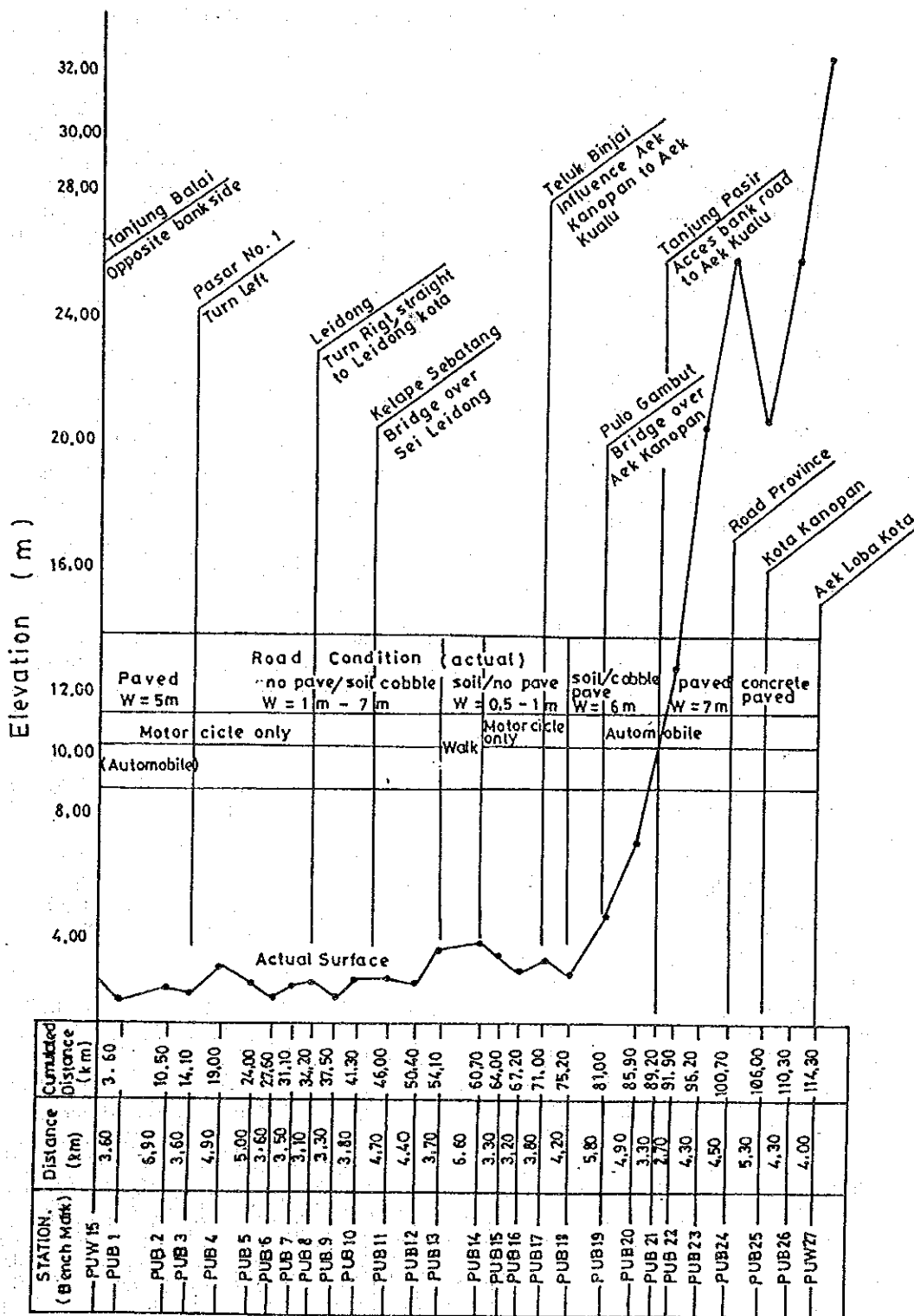


Fig. C-8 ROAD SURFACE PROFILE OF THE LINK ROAD

Table C-25

DESIGN VALUE APPLIED FOR EARTH WORKS  
OF THE FLOOD CONTROL PROJECT

## 1. Embankment works

Item	Lebah R.	Asahan R.	Silau R.
1. Density			
- Dry density (t/cu.m)	1.0	1.2	1.1
- Wet density (t/cu.m)	1.55	1.55	1.60
- Saturated density (t/cu.m)	1.66	1.8	1.7
- Submerged density (t/cu.m)	0.6	0.8	0.7
2. Shear Strength			
- Cu (t/sq.m)	3.0	3.0	2.5
- Pu (degree)	5	5	5
3. Permeability			
- Coefficient of permeability (k:cm/sec)	5*10 <sup>-5</sup>	5*10 <sup>-5</sup>	1*10 <sup>-3</sup>
4. Dimension of Levee			
- Side slope	1:2	1:2	1:2
- Extra embankment for consolidation settlement (% of total direct height)	7.5-8.5	7.5-8.5	8.0-19.0

## 2. Foundation

Item	Lebah	Asahan	Silau
1. Density			
- Dry density (t/cu.m)	0.97	1.00	1.10
- Wet density (t/cu.m)	1.55	1.60	1.65
- Saturated density (t/cu.m)	1.60	1.65	1.70
- Submerged density (t/cu.m)	0.60	0.65	0.70
2. Shear Strength			
- Cu (t/sq.m)	1.0	1.0	1.5
- Pu (degree)	5	5	5
- C' (t/sq.m)	0.30	0.35	0.30
- Pu' (degree)	15	20	20
3. Permeability			
- Coefficient of permeability (k:cm/sec)	5*10 <sup>-5</sup>	5*10 <sup>-5</sup>	5*10 <sup>-5</sup>

Note; Cu, C' : Cohesion Pu, Pu' : Angle of internal friction

## 3. Ultimate Bearing Capacity

(Unit: t/m<sup>2</sup> in square shape)

Item	Foundation Width (m)	Depth of Foundation (m)				
		0	1	2	3	4
Lebah river	2-12	6.9	8.3	8.4	9.2	10.0
Asahan river	2-12	6.9	7.7	8.6	9.4	10.3
Silau river	2-12	10.3	11.2	12.2	13.1	14.0

Source: Design report on the Lower Asahan River Flood Control Project, DGWRD in 1989.

Table C-26 LOCATION OF CONCRETE AGGREGATES

Material	Site	Location	Remarks
Coarse aggregate	Bandar Pulau	about 15 km upstream of Pulau Raja	20,000-30,000 m <sup>3</sup>
	G. Pamela	about 20 km southwest from Tebing Tinggi	
Fine aggregate (sand)	Riverbeds of the Asahan and Silau rivers		

Table C-27 FOUNDATION CONDITION OF SILAU INTEGRATED WEIR SITE

Item/ Depth below Ground Surface (m)	Point Just Down-stream of Proposed Site	Point Just Up-stream of Proposed Site
<b>Soil layer</b>		
0-5	- clay	- loose fine sand
5-10	- loose sand	- loose fine sand
10-15	- clay sand	- soft clay
<b>Average N value</b>		
0-5	- 4	- 9
5-10	- 12	- 12
10-15	- 4	- 6

Note:

1) Boring logs of the above 2 sites are given on Fig. C-10.

Source : Detailed design of the Lower Asahan River Flood Control Project, DGWRD, 1988

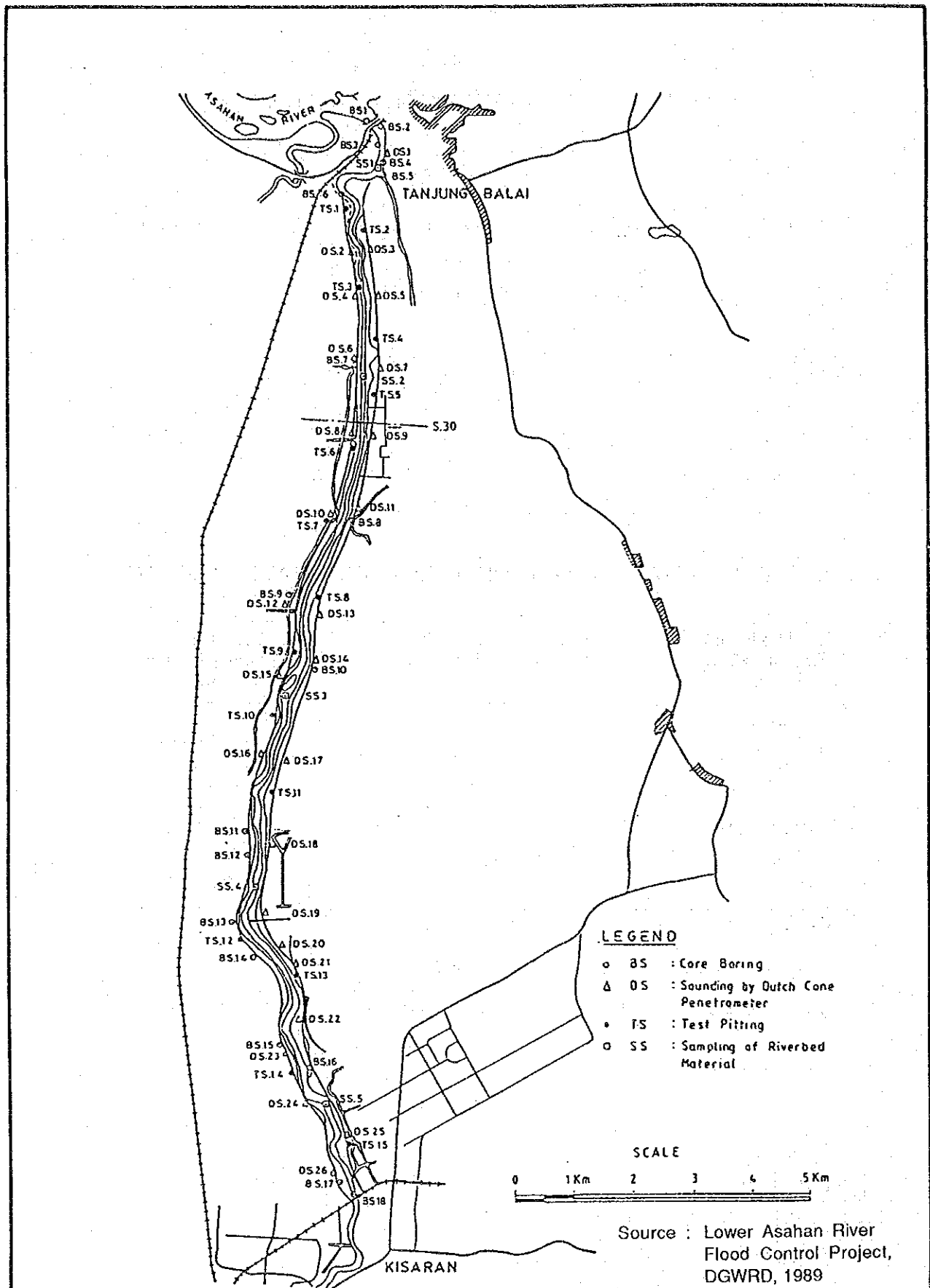


Fig. C-9 GEO-TECHNICAL INVESTIGATION SITES ALONG SILAU RIVER

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 MASTER PLAN STUDY ON  
 LOWER ASAHAN RIVER BASIN DEVELOPMENT  
 Japan International Cooperation Agency



# GEOLOGICAL RECORD OF BORE HOLE

HOLE No. BS.17

PROJECT :	DEPTH OF HOLE : 20.00 M
LOCATION : IN SILAU RIVER	ELEVAT OF SURFACE : M
DATE STARTED : 25 JUN. 1988	ELEVAT OF HOLE BOT : M
DATE COMPLETED : 27 JUN. 1988	INCLINATION OF HOLE : VERTICAL
DIAMETER OF HOLE :	DRILLED BY :
MACHINE :	GEOLOG. LOG BY :

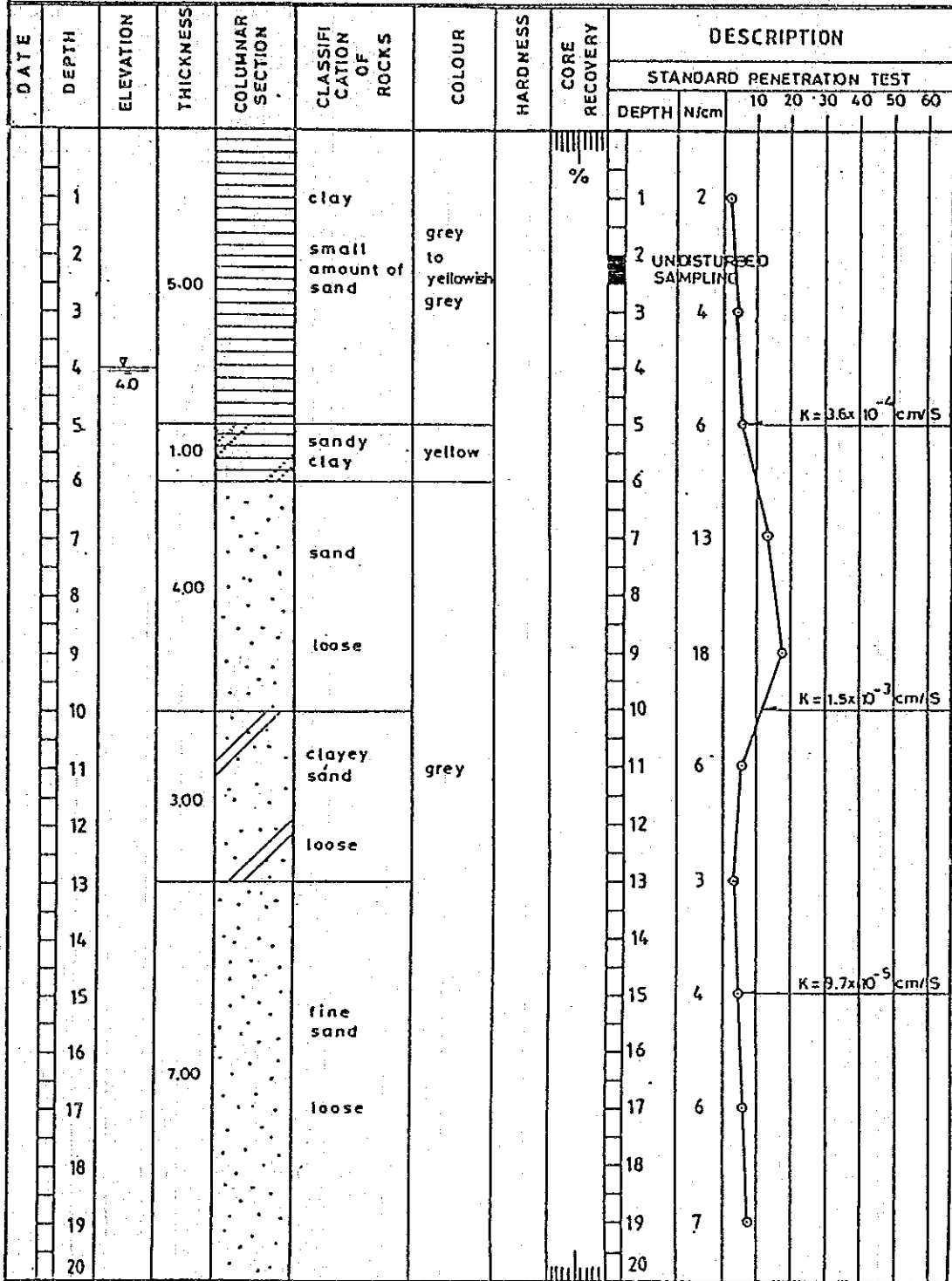


Fig. C-10 GEOLOGICAL RECORD OF BORE HOLE AT SILAU INTEGRATED WEIR (1/2)

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 LOWER ASAHAN RIVER BASIN DEVELOPMENT  
 Japan International Cooperation Agency



Table C-28 ANNUAL SEDIMENT TRANSPORT CAPACITY

	(m <sup>3</sup> /year)		
Site/item	Wash Load	Suspended/bed load	Total
1. Silau river			
Kisaran	155,700 (78)	422,700 (211)	578,400 (289)
Tg. Balai	-	323,600 (162)	-
Balance	-	+99,100	-
2. Asahan river			
Pulau Raja	201,800 (43)	210,000 (45)	411,800 (88)
Tg. Balai	-	197,100 (42)	-
Balance	-	+12,900	-

Note; ( ) indicates ppm in unit.  
 + indicates deposit in the riverbed.  
 Sediment transport capacity of the channels have been calculated by applying Brown formula.

Source : Part-1 Study in 1985

Table C-29 GRAIN SIZE DISTRIBUTION

Percent finer by weight (%)	Mean grain size (mm)	
	Kisaran	Pulau Raja
90	1.53	1.28
85	1.36	1.17
65	0.81	0.84
50	0.62	0.69
35	0.49	0.57
	(1.52)	(1.47)

Note; ( ) indicates uniformity coefficient of grain size.

Source Design Report on River Improvement Works, Lower Asahan River Flood Control Project, DGRWD, June, 1989

Table C-30 MAIN FEATURES OF PROJECT WORKS FOR THE LOWER ASAHAN RIVER FLOOD CONTROL PROJECT BY DGWRD

Item	Objective Rivers		
	Asahan R.	Lebah R.	Silau R.
1. Design flood			
- Return period	10 yr	10 yr	10 yr
- Design discharge (cu.m/s)	1,100	-	600
2. Length to be improved (km)	17.2	15.2	20.0
3. Major proposed works			
- Excavation/dredging (1,000 cu/m)	3,591	-	2,222
- Embankment (1,000 cu.m)	758	238	1,250
- Revetment (m)	-	-	-
- Parapet wall (m)	-	-	3,130
4. Land acquisition and compensation			
- Land (1,000 sq.m)	3,188	470	3,026
- House (nos)	47	20	545
- Tree (nos)	2,000	-	34,100

Note:

- 1) Based on the results of both the Part-1 Study in 1985, the Government of Republic of Indonesia (GOI) decided to carry out the detailed design of the Lower Asahan River Flood Control Project, with the loan of the Overseas Economic Cooperation Fund(OECF), Japan
- 2) The design was proceeded for 15 months from March 1988 to June 1989.
- 3) Project Cost: Rp. 107,650 mill. (1989 price level)  
F/C : 72,630 mill.  
L/C : 35,020 mill.  
US\$1.0 = ¥130 = Rp. 1,750

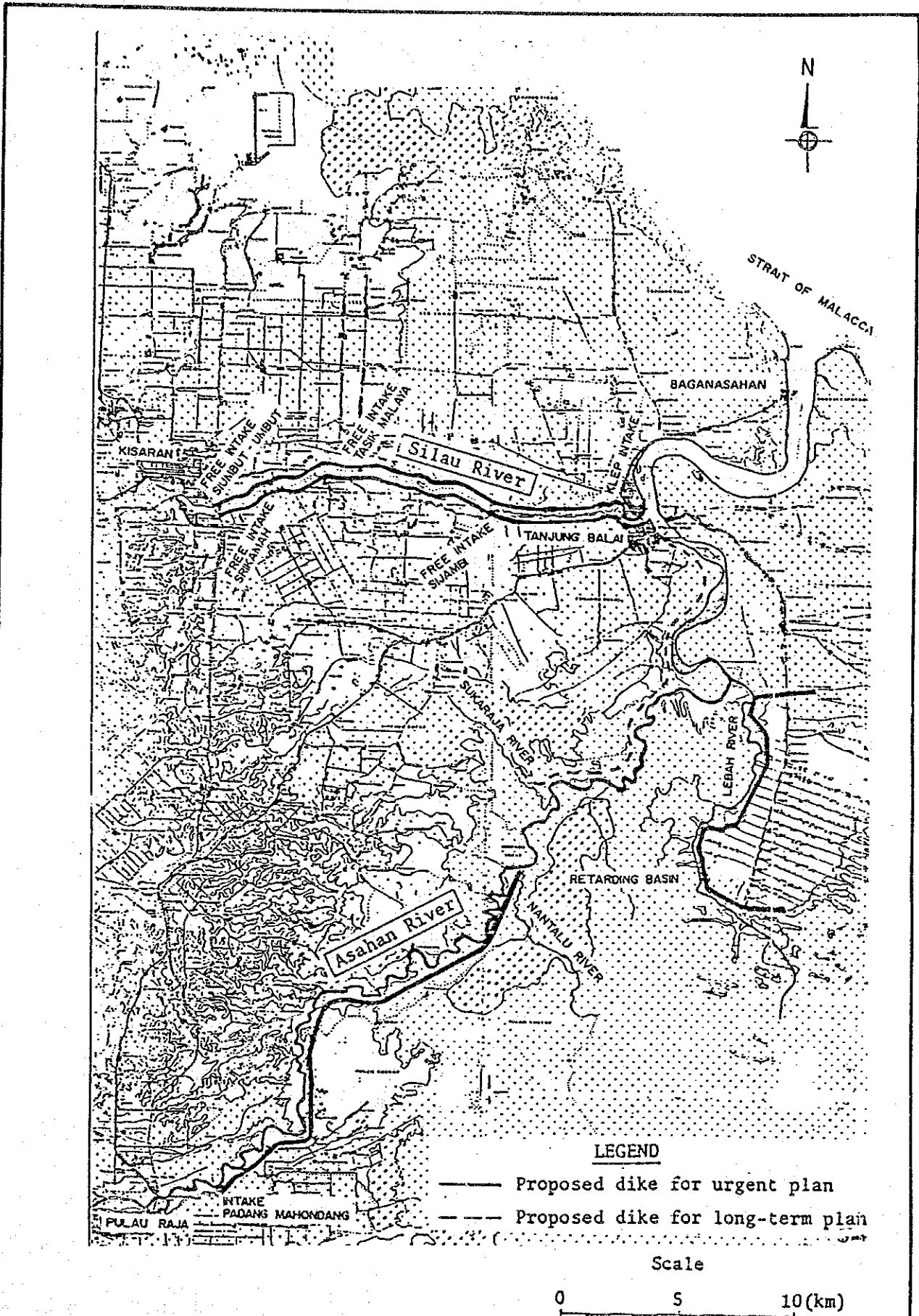


FIG. C-11 GENERAL MAP OF LOWER ASAHAN RIVER FLOOD CONTROL PROJECT

Republic of Indonesia  
 MASTER PLAN STUDY ON  
 LOWER ASAHAN RIVER BASIN DEVELOPMENT  
 Japan International Cooperation Agency



*Master Plan Study on Lower Asahan River Basin Development*

*Vol. 3  
Agricultural Development Plan*

**Appendix 3-D**

**Project Description Sheet**





**Appendix 3-D**  
**PROJECT DESCRIPTION SHEET**

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## II. PRESENT CONDITIONS OF THE PROJECT AREA

### 2.1 Socio-economic Conditions in 1988

(1) Total population		46,100 persons
(2) Number of household		8,500 nos
(3) Family size(average)		5.4 persons
(4) Land holding size (average)		1.1 ha/farm household
(5) Farm Income level(average)	Rp.	1.1 mil/household/year

### 2.2 Natural Conditions

(1) Soil condition :	Coarse to fine textured soils, partly covered with organic soils (peat)
(2) Topography :	Flat
(3) Altitude :	El. 15-2m
(4) Mean Annual rainfall :	1,640 mm/year
(5) 5-year low annual rainfall :	1,547 mm/year

### 2.3 Agricultural Activities

#### (1) Cropping area and unit yield of Paddy

Sub-area	WP	DP	RP	Total
(Cropping area, ha)	6,940	4,164	6,290	17,394
(Unit yield, ton/ha)	4.0	4.0	2.0	

WP: Irrigated Wet Season Paddy      RP: Rainfed paddy field  
 DP: Irrigated Dry Season Paddy

- (2) Use of fertilizer : High in irrigated paddy (I/P), extremely low in rainfed paddy (R/P)  
 (3) Use of chemicals : Common in IP/RP  
 (4) Use of farm machinery : Non  
 (5) Present land use (ha in Gross)

Sub-area	Irrigated Sawah	Rainfed Sawah	Swamp area	Others	Total
1 Silau river system					
(1) PU Area	3,145	920	0	635	4,700
(2) Non-PU Area	0	2,375	0	0	2,375
Sub-total	3,145	3,295	0	635	7,075
2 Bunut river system					
(1) PU Area	4,490	330	0	885	5,705
(2) Non-PU Area	0	4,220	0	0	4,220
Sub-total	4,490	4,550	0	885	9,925
<b>Total</b>	<b>7,635</b>	<b>7,845</b>	<b>0</b>	<b>1,520</b>	<b>17,000</b>

## 2.4 Existing Infrastructure

## (1) Irrigation and drainage facilities

Sub-area	Irrigation canal (km)	Drainage canal (km)	Farm road (km)	Flood dike (km)	Related structures (nos)
Silau river system (PU)	60.8	36.1	0.4	28.0	88.0
Bunut river system (PU)	45.2	39.8	0.0	17.5	86.0
<b>Total</b>	<b>106.0</b>	<b>75.9</b>	<b>0.4</b>	<b>45.5</b>	<b>174.0</b>

(2) Domestic water supply

(3) Electric supply

(4) Other key facilities

## 2.5 Flood Conditions

- (1) Area affected by 10-yr flood : 8,500 ha  
(standing water depth more than 30 cm for more than 1 day)
- (2) Degree of flood :  
(i) Average stand. water depth : 0.6 - 1.0 m  
(ii) Average duration : 3 - 6 days

## III. MAIN CONSTRAINTS OF THE AREA

- (#) Lack of irrigation water supply
- (#) Suffered by seasonal river flooding
- (#) Pest and diseases
- (#) Poor drainability
- (#) Others, if any ; Poor O&M activity

## IV. PROPOSED DEVELOPMENT PLAN

## 4.1 Agricultural Development Plan

## (1) Land use plan

Present land use	Land Use Plan				Total
	Net Irrigated Sawah	Net Rainfed Sawah	Oil Palm	Others*	
Irrig. Sawah	6,940	-	-	695	7,635
Rainfed Sawah	6,290	-	-	1,555	7,845
Swamp	-	-	-	-	0
Others	1,065	-	-	455	1,520
<b>Total</b>	<b>14,295</b>			<b>2,705</b>	<b>17,000</b>

\* Others includes canals, roads, house yard, etc.

(2) Cropping pattern : Double crop of paddy

(3) Cropping intensity : 200%

(4) Target yield

(i) Wet season paddy :	5.0 - 5.5	ton/ha
(ii) Dry season paddy :	5.0 - 5.5	ton/ha
(iii) Other crop :	-	ton/ha

## 4.2 Related development plan

(1) Development plan of DPU in Pelita V

(i) DPU North Sumatera Province intends to realise the project.

(2) Transmigration program to be expected

(i) Objective area 0 ha

(ii) Numbers of transmigrates; Non person

(3) River improvement works

(i) Detailed design of flood control work for the Silau river has been completed in June 1989.  
The final arrangement for the work has been commenced by DGWRD.

## 4.3 Proposed Project Works

(1) Principal Features of Project Works

(i) Irrigation system

- Water source development : Silau river, Bunut river

- Diversion structure : Silau Integrated weir, Silau diversion weir, S. Serani weir

- Irrigation canals New: 367 km, Improved: 37 km

(ii) Drainage canals New: 245 km, Improved: 10 km

(iii) Flood protection dike New: 56 km, Improved: 0 km

(iv) Farm road New: 614 km, Improved: 47 km

(v) On-farm facilities 13,222 ha

(vi) Land reclamation 1,065 ha

( ) Others;

## V. PROJECT COST ESTIMATE (FINANCIAL COST)

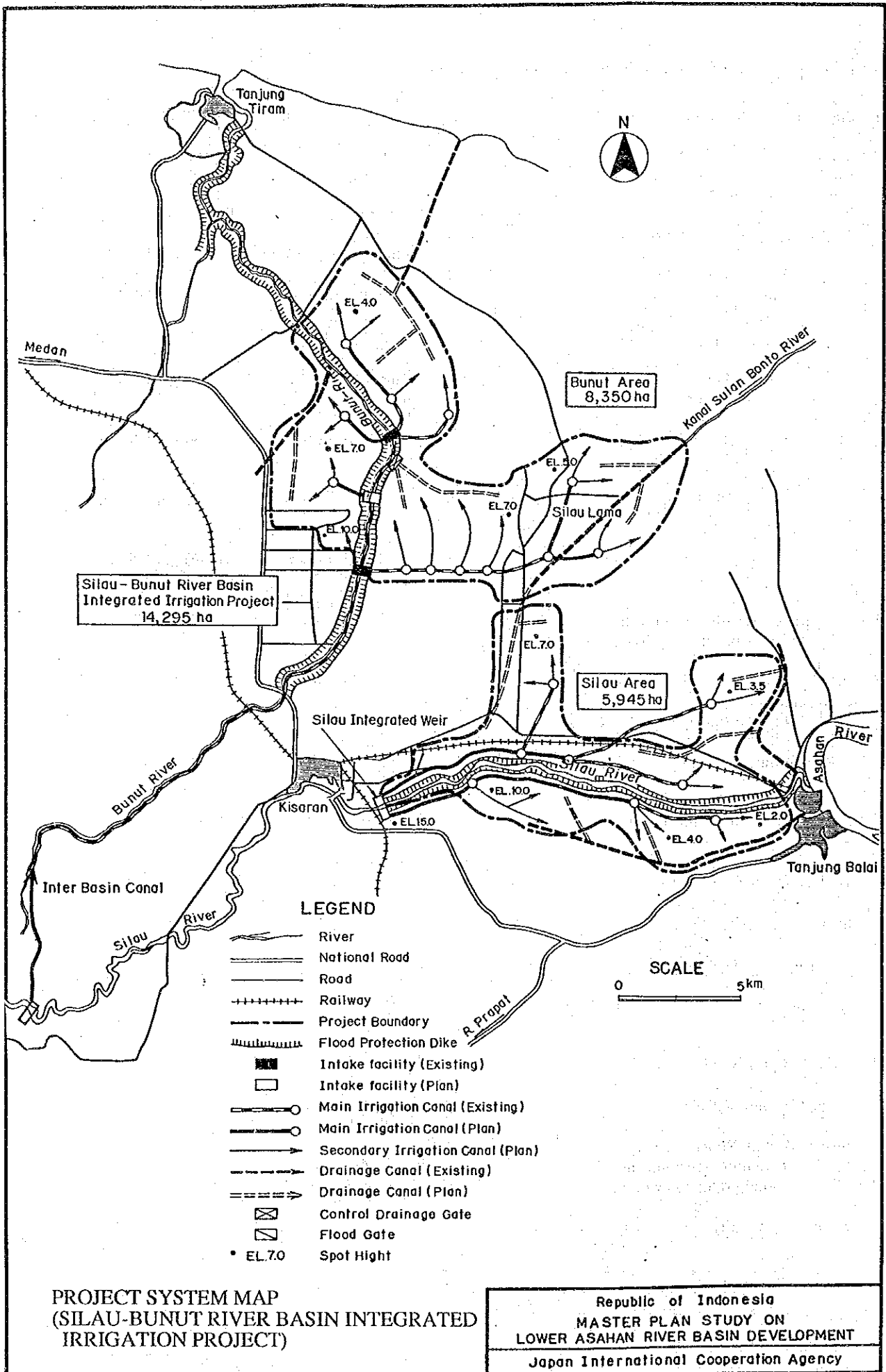
5.1 Land and Compensation Cost	Rp.	5,069 million	200 per US\$ /ha
5.2 Survey and Design Costs (5 % of Item 5.3 (1))	Rp.	6,820 million	269 per US\$ /ha
5.3 Construction Cost			
		<b>TOTAL NET IRRRI. AREA</b>	<b>14,300 HA</b>
<b>(1) Direct construction cost</b>			
(i) Irrigation and drainage facilities	Rp.	89,800 million	3,543 per US\$ /ha
(ii) Flood prevention works	Rp.	30,400 million	1,201 per US\$ /ha
(iii) On-farm and land reclamation	Rp.	16,200 million	640 per US\$ /ha
Sub-total (1)	Rp.	136,400 million	5,389 per US\$ /ha
<b>(2) Physical contingency</b> (30 % of Item (1))	Rp.	40,920 million	1,617 per US\$ /ha
<b>(3) Sub-total of Items</b> (1)+(2)	Rp.	177,320 million	7,006 per US\$ /ha
<b>(4) Tax on Civil Works(VAT)</b> (10 % of Item 5.3-(3))	Rp.	17,732 million	701 per US\$ /ha
<b>Total of Item 5.3</b>	Rp.	177,320 million	7,006 per US\$ /ha
5.4 Cost of the Consultants Services (10 % of total cost of Item 5.3-(1))	Rp.	13,640 million	539 per US\$ /ha
5.5 Administration Cost of the Government (1 % of total cost of Item 5.3)	Rp.	1,773 million	70 per US\$ /ha
5.6 Price contingency	Rp.	0 million	0 per US\$ /ha
<b>5.7 Total Cost of the Project</b>	Rp.	<b>204,622 million</b>	<b>8,084 per US\$ /ha</b>

## VI. IMPLEMENTATION SCHEDULE

6.1 Survey and design	1.5 Years
6.2 Construction schedule	5 Years
6.3 Executing agency	DGWRD-DPU

## VII. PROJECT EVALUATION

7.1 Project Economic Cost	Rp.	159,650 million
7.2 Project Annual Economic Benefit		
(1) Irrigation development	Rp.	18,690 million
(2) Flood protection works	Rp.	6,639 million
7.3 Economic viability		
	EIRR:	13.2 %
	B/C :	1.32 (at 10 %)







## II. PRESENT CONDITIONS OF THE PROJECT AREA

### 2.1 Socio-economic Conditions in 1988

(1)	Total population		19,300 persons
(2)	Number of farm household		3,600 nos
(3)	Family size(average)		5.3 persons
(4)	Land holding size (average)		1.1 ha/farm household
(5)	Farm Income level(average)	Rp.	0.76 mil/household/year

### 2.2 Natural Conditions

(1)	Soil condition	:	Fine textured soils, partly covered with peat
(2)	Topography	:	Flat
(3)	Altitude	:	El. 5-2m
(4)	Annual rainfall	:	1,640 mm/year
(5)	5-year low rainfall	:	1,547 mm/year

### 2.3 Agricultural Activities

#### (1) Cropping area and unit yield of Paddy

Sub-area	WP	DP	RP	Total
(Cropping area, ha)	-	-	4,040	4,040

(Unit yield, ton/ha)	-	-	2.0	
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WP: Irrigated Wet Season Paddy      RP: Rainfed paddy field  
 DP: Irrigated Dry Season Paddy

- (2) Use of fertilizer : Limited  
 (3) Use of chemicals : Common  
 (4) Use of farm machinery : Non

#### (5) Present land use (ha in Gross)

Sub-area	Irrigated Sawah	Rainfed Sawah	Swamp area	Others	Total
1 DP Tambung Tulang	0	5,050	0	0	5,050
2 Non-PU area	0	0	2,450	0	2,450
<b>Total</b>	<b>0</b>	<b>5,050</b>	<b>2,450</b>	<b>0</b>	<b>7,500</b>

## 2.4 Existing Infrastructure

## (1) Irrigation and drainage facilities

Sub-area	Irrigation canal (km)	Drainage canal (km)	Farm road (km)	Flood dike (km)	Related structures (nos)
DP, Tambung Tulang	0.0	7.0	0.0	0.0	1

## (2) Domestic water supply \_\_\_\_\_

## (3) Electric supply \_\_\_\_\_

## (4) Other key facilities \_\_\_\_\_

## 2.5 Flood Conditions

(1) Area affected by flood : 600 ha  
(standing water depth more than 30 cm for more than 1 day)

## (2) Degree of flood :

(i) Average stand. water depth : 1.0 m  
(ii) Average duration : 3 days

## III. MAIN CONSTRAINTS OF THE AREA

- ( ) Lack of irrigation water supply
- (#) Suffered by seasonal flooding
- (#) Pest and diseases
- (#) Poor drainability
- (#) Others, if any ; Poor Access in wet season

## IV. PROPOSED DEVELOPMENT PLAN

## 4.1 Agricultural Development Plan

## (1) Land use plan

Present land use	Land Use Plan				Total
	Net Irrigated Sawah	Net Rainfed Sawah	Oil Palm	Others*	
Irr. Sawah	-	-	-	-	0
Rainfed Sawah	-	4,040	-	1,010	5,050
Swamp	-	1,715	-	735	2,450
Others	-	-	-	-	0
<b>Total</b>		<b>5,755</b>		<b>1,745</b>	<b>7,500</b>

\* Others includes canals, roads, house yard, etc.

(2) Cropping pattern : Single crop of paddy a year

(3) Cropping intensity : 100 %

(4) Target yield

(i) Wet season paddy : 4.0 ton/ha  
(ii) Dry season paddy : - ton/ha  
(iii) Other crop : - ton/ha

## 4.2 Related development plan

(1) Development plan of DPU in Pelita V and VI

(i) Development is scheduled by Dept. of Swamp Development, DPU North Sumatera Province

(2) Transmigration program to be expected

(i) Objective area : 1,745 ha

(ii) Numbers of transmigrates ; 1,700 families

(3) River improvement works : Non

## 4.3 Proposed Project Works

(1) Principal Features of Project Works

(i) Drainage canals New: 137 km, Improved: 7 km

(ii) Farm road New: 137 km, Improved: 7 km

(iii) On-farm facilities 5,755 ha

(iv) Land reclamation of swamp area 1,715 ha

( ) Others; \_\_\_\_\_

## V. PROJECT COST ESTIMATE (FINANCIAL COST)

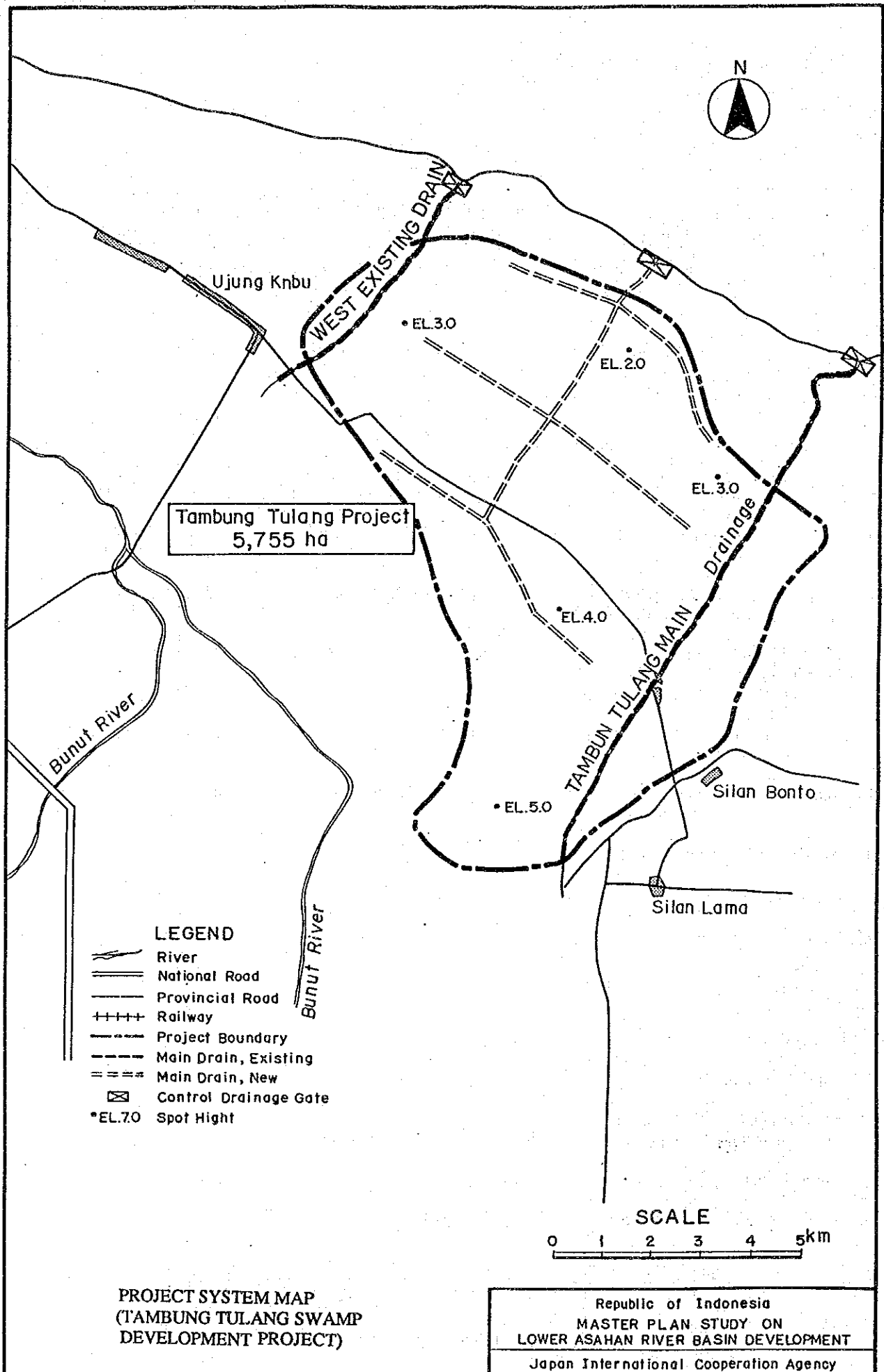
5.1 Land and Compensation Cost	Rp.	708 million	70 per US\$/ha
5.2 Survey and Design Costs (5 % of Item 5.3 (1))	Rp.	1,035 million	102 per US\$/ha
5.3 Construction Cost			
		TOTAL GROSS AREA million	5,750 HA
(1) Direct construction cost			
(i) Drainage facilities	Rp.	13,300 million	1,307 per US\$/ha
(ii) On-farm and land reclamation	Rp.	7,400 million	727 per US\$/ha
Sub-total (1)	Rp.	20,700 million	2,034 per US\$/ha
(2) Physical contingency (30 % of Item (1))	Rp.	6,210 million	610 per US\$/ha
(3) Sub-total of Items (1)+(2)	Rp.	26,910 million	2,644 per US\$/ha
(4) Tax on Civil Works(VAT) (10 % of Item 5.3-(3))	Rp.	2,691 million	264 per US\$/ha
Total of Item 5.3	Rp.	26,910 million	2,644 per US\$/ha
5.4 Cost of the Consultants Services (10 % of total cost of Item 5.3-(1))	Rp.	2,070 million	203 per US\$/ha
5.5 Administration Cost of the Government (1 % of total cost of Item 5.3)	Rp.	269 million	26 per US\$/ha
5.6 Price contingency	Rp.	0 million	0 per US\$/ha
5.7 Total Cost of the Project	Rp.	30,992 million	3,045 per ha

## VI. IMPLEMENTATION SCHEDULE

6.1 Survey and design	1.5 Years
6.2 Construction schedule	3.5 Years
6.3 Executing agency	DGWRD-DPU

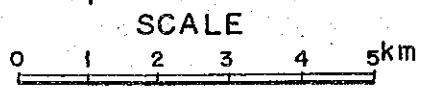
## VII. PROJECT EVALUATION

7.1 Project Economic Cost	Rp.	24,230 million
7.2 Project Annual Economic Benefit (1) Irrigation development	Rp.	3,090 million
7.3 Economic viability		
	EIRR:	9.9 %
	B/C :	0.99 (at 10 %)



Tambung Tulang Project  
5,755 ha

- LEGEND**
- River
  - National Road
  - Provincial Road
  - Railway
  - Project Boundary
  - Main Drain, Existing
  - Main Drain, New
  - Control Drainage Gate
  - \*EL.7.0 Spot Height



**PROJECT SYSTEM MAP  
(TAMBUNG TULANG SWAMP  
DEVELOPMENT PROJECT)**

Republic of Indonesia  
**MASTER PLAN STUDY ON  
 LOWER ASAHAN RIVER BASIN DEVELOPMENT**  
 Japan International Cooperation Agency



## II. PRESENT CONDITIONS OF THE PROJECT AREA

### 2.1 Socio-economic Conditions in 1988

(1) Total population	-	persons
(2) Number of farm household	-	nos
(3) Family size(average)	-	persons
(4) Land holding size (average)	-	ha/farm household
(5) Income level(average)	Rp. -	/household/year

### 2.2 Natural Conditions

(1) Soil condition	:	Fine texture soils partly covered with peat
(2) Topography	:	Flat
(3) Altitude	:	El. 6-3 m
(4) Annual rainfall	:	2,435 mm/year
(5) 5-year low rainfall	:	2,134 mm/year

### 2.3 Agricultural Activities

#### (1) Cropping area and unit yield of Paddy

Sub-area	WP	DP	RP	Total
(Cropping area, ha)				

(Unit yield, ton/ha)

WP: Irrigated Wet Season Paddy      RP: Rainfed paddy field  
 DP: Irrigated Dry Season Paddy

(2) Use of fertilizer	:	Non
(3) Use of chemicals	:	Non
(4) Use of farm machinery	:	Non

#### (5) Present land use (ha in Gross)

Sub-area	Irrigated Sawah	Rainfed Sawah	Swamp area	Others	Total
1 Rawa Simpang Empat (Non-PU area)	0	0	4,000	0	4,000
<b>Total</b>	<b>0</b>	<b>0</b>	<b>4,000</b>	<b>0</b>	<b>4,000</b>



## 2.4 Existing Infrastructure

## (1) Irrigation and drainage facilities

Sub-area	Irrigation canal (km)	Drainage canal (km)	Farm road (km)	Flood dike (km)	Related structures (nos)
				4.0	

(2) Domestic water supply \_\_\_\_\_

(3) Electric supply \_\_\_\_\_

(4) Other key facilities \_\_\_\_\_

## 2.5 Flood Conditions

(1) Area affected by flood : 4,000 ha  
(standing water depth more than 30 cm for more than 1 day)

(2) Degree of flood :

(i) Average stand. water depth : 0.6 m

(ii) Average duration : 7 days

## III. MAIN CONSTRAINTS OF THE AREA

- ( ) Lack of irrigation water supply
- (# ) Suffered by seasonal river flooding
- ( ) Pest and diseases
- ( ) Poor drainability
- (# ) Others, if any ; Poor Accesability

#### IV. PROPOSED DEVELOPMENT PLAN

##### 4.1 Agricultural Development Plan

(1) Land use plan

Present land use	Land Use Plan				Total
	Net Irrigated Sawah	Net Rainfed Sawah	Oil Palm	Others*	
Irri. Sawah	-	-	-	-	0
Rainfed Sawah	-	-	-	-	0
Swamp	-	2,800	-	1,200	4,000
Others	-	-	-	-	0
<b>Total</b>		<b>2,800</b>		<b>1,200</b>	<b>4,000</b>

\* Others includes canals, roads, house yard, etc.

(2) Cropping pattern : Single crop of paddy in wet season

(3) Cropping intensity : 100 %

(4) Target yield

(i) Wet season paddy : 4.0 ton/ha  
(ii) Dry season paddy : - ton/ha  
(iii) Other crop : - ton/ha

##### 4.2 Related development plan

(1) Development plan of DPU in Pelita V

(i) A part of the area is scheduled to be developed by Dept. of Swamp Development, DPU Nourth Sumatera Province

(2) Transmigration program

(i) Objective area : 2,800 ha

(ii) Numbers of transmigrates ; 2,800 families

(3) River improvement works

(i) Long term improvement plan was proposed in Part-1 study

##### 4.3 Proposed Project Works

(1) Principal Features of Project Works

(i) Drainage canals	New:	70 km,	Improved:	0 km
(ii) Flood protection dike	New:	30 km,	Improved:	0 km
(iii) Farm road	New:	70 km,	Improved:	0 km
(iv) On-farm facilities		2,800 ha		
(v) Land reclamation of swamp area		2,800 ha		
( ) Others;				

## V. PROJECT COST ESTIMATE (FINANCIAL COST)

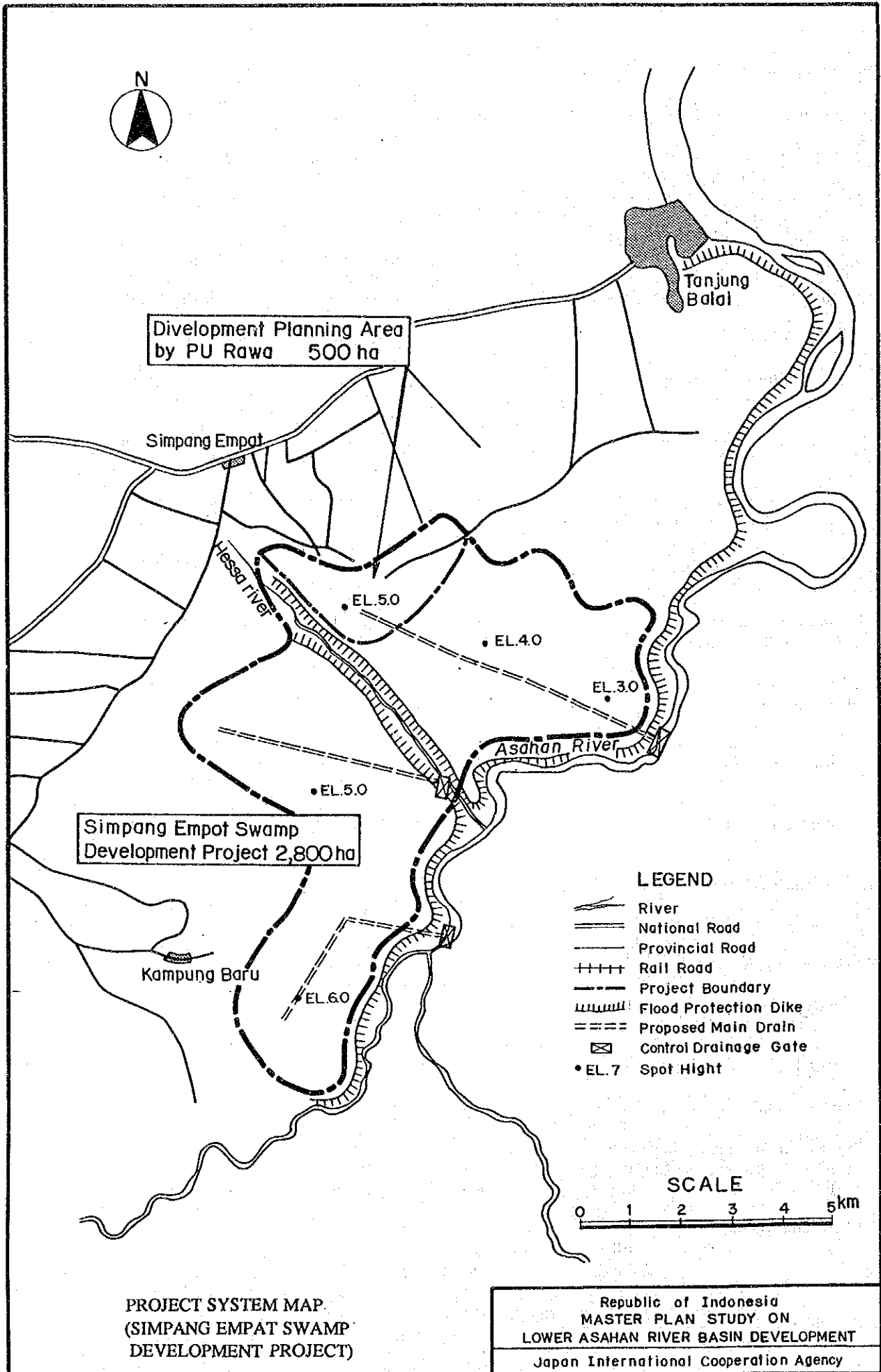
5.1 Land and Compensation Cost	Rp.	1,299 million	262 per US\$/ha
5.2 Survey and Design Costs (5 % of Item 5.3 (1))	Rp.	835 million	168 per US\$/ha
5.3 Construction Cost			
		<b>TOTAL NET IRRRI AREA</b>	<b>2,800 HA</b>
(1) <b>Direct construction cost</b>			
(i) Drainage facilities	Rp.	6,700 million	1,352 per US\$/ha
(ii) Flood prevention works	Rp.	5,800 million	1,170 per US\$/ha
(iii) On-farm and land reclamation	Rp.	4,200 million	847 per US\$/ha
Sub-total (1)	Rp.	16,700 million	3,370 per US\$/ha
(2) <b>Physical contingency</b> (30 % of Item (1))	Rp.	5,010 million	1,011 per US\$/ha
(3) Sub-total of Items (1)+(2)	Rp.	21,710 million	4,381 per US\$/ha
(4) Tax on Civil Works(VAT) (10 % of Item 5.3-(3))	Rp.	2,171 million	438 per US\$/ha
Total of Item 5.3	Rp.	21,710 million	4,381 per US\$/ha
5.4 Cost of the Consultants Services (10 % of total cost of Item 5.3-(1))	Rp.	1,670 million	337 per US\$/ha
5.5 Administration Cost of the Government (1 % of total cost of Item 5.3)	Rp.	217 million	44 per US\$/ha
5.6 Price contingency	Rp.	0 million	0 per US\$/ha
<b>5.7 Total Cost of the Project</b>	<b>Rp.</b>	<b>25,731 million</b>	<b>5,192 per US\$/ha</b>

## VI. IMPLEMENTATION SCHEDULE

6.1 Survey and design	2 Years
6.2 Construction schedule	3 Years
6.3 Executing agency	DGWRD-DPU

## VII. PROJECT EVALUATION

7.1 Project Economic Cost	Rp.	19,545 million
7.2 Project Annual Economic Benefit		
(1) Irrigation development	Rp.	2,150 million
(2) Flood protection works	Rp.	0 million
7.3 Economic viability		
	EIRR:	9.6 %
	B/C :	0.96 (at 10 %)





## II. PRESENT CONDITIONS OF THE PROJECT AREA

### 2.1 Socio-economic Conditions in 1988

(1) Total population		13,200 persons
(2) Number of farm household		2,700 nos
(3) Family size(average)		4.9 persons
(4) Land holding size (average)		0.8 ha/farm household
(5) FarmIncome level(average)	Rp.	1.1 mil/household/year

### 2.2 Natural Conditions

(1) Soil condition	:	Medium to fine textured soils, partly covered with peat
(2) Topography	:	Flat
(3) Altitude	:	El. 10-5m
(4) Annual rainfall	:	2,435 mm/year
(5) 5-year low rainfall	:	2,134 mm/year

### 2.3 Agricultural Activities

#### (1) Cropping area and unit yield of Paddy

Sub-area	WP	DP	RP	Total
(Cropping area, ha)	1,100	660	1,170	2,770

(Unit yield, ton/ha)			
DP.Pd. Mahondang	4.0	4.0	2.0

WP: Irrigated Wet Season Paddy      RP: Rainfed paddy field  
 DP: Irrigated Dry Season Paddy

- (2) Use of fertilizer : Considerable in Irrigated areas, limited in Rainfed areas  
 (3) Use of chemicals : Common  
 (4) Use of farm machinery : Non

#### (5) Present land use (ha in Gross)

Sub-area	Irrigated Sawah	Rainfed Sawah	Swamp area	Others	Total
1 DP Pd. Mahondang	1,100	1,400	0	830	3,330
2 Rawa Nantalu (Non-PU)	0	60	4,910	0	4,970
<b>Total</b>	<b>1,100</b>	<b>1,460</b>	<b>4,910</b>	<b>830</b>	<b>8,300</b>

## 2.4 Existing Infrastructure

## (1) Irrigation and drainage facilities

Sub-area	Irrigation canal (km)	Drainage canal (km)	Farm road (km)	Flood dike (km)	Related structures (nos)
DP Pd. Mahondang	12.4	16.0	0.0	10.0	24

## (2) Domestic water supply

## (3) Electric supply

## (4) Other key facilities

## 2.5 Flood Conditions

- (1) Area affected by flood : 8,300 ha  
(standing water depth more than 30 cm for more than 1 day)
- (2) Degree of flood :
- (i) Average stand. water depth : 0.6 m
- (ii) Average duration : 7 days

## III. MAIN CONSTRAINTS OF THE AREA

- (#) Lack of irrigation water supply
- (#) Suffered by seasonal river flooding
- (#) Pest and diseases
- (#) Poor drainability
- (#) Others, if any ; Poor accessibility

## IV. PROPOSED DEVELOPMENT PLAN

## 4.1 Agricultural Development Plan

## (1) Land use plan

(unit: ha)

Present land use	Land Use Plan				Total
	Net Irrigated Sawah	Net Rainfed Sawah	Oil Palm	Others*	
Irr. Sawah	1,000	—	—	100	1,100
Rainfed Sawah	1,168	—	—	292	1,460
Swamp	3,437	—	—	1,473	4,910
Others	580	—	—	250	830
<b>Total</b>	<b>6,185</b>			<b>2,115</b>	<b>8,300</b>

\* Others includes canals, roads, house yard, etc.

(2) Cropping pattern : Double crop of paddy

(3) Cropping intensity : 200 %

(4) Target yield

- (i) Wet season paddy : 5.0 ton/ha
- (ii) Dry season paddy : 5.0 ton/ha
- (iii) Other crop : ton/ha

## 4.2 Related development plan

(1) Development plan of DPU in Pelita V

(i) Rehabilitation and extension work for the existing scheme

(2) Transmigration program

(i) Objective area 3,400 ha in Net,

(ii) Numbers of transmigrates ; 3,400 families

(3) River improvement works

(i) Urgent flood control project ; Detailed design work has been completed in June, 1989

## 4.3 Proposed Project Works

(1) Principal Features of Project Works

(i) Irrigation system

- Water source development

- Diversion structure

- Irrigation canals

(ii) Drainage canals

(iii) Flood protection dike

(iv) Farm road

(v) On-farm facilities

(vi) Land reclamation of swamp area

( ) Others;

Asahan

Asahan free intake (new)

New: 204 km, Improved: 12 km

New: 139 km, Improved: 12 km

New: 29 km, Improved: 0 km

New: 343 km, Improved: 13 km

6,185 ha

4,015 ha



## V. PROJECT COST ESTIMATE (FINANCIAL COST)

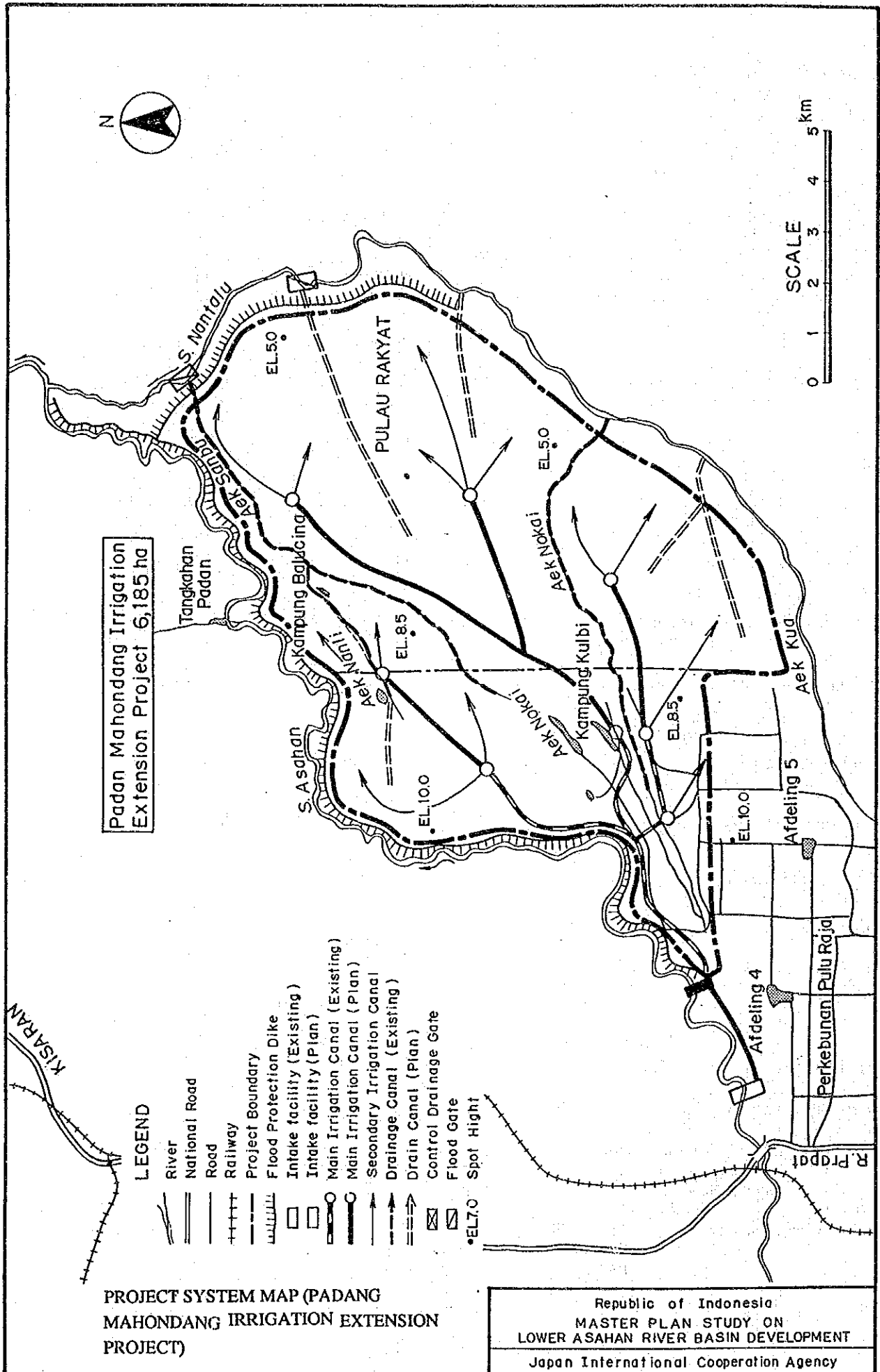
5.1 Land and Compensation Cost	Rp.	1,483 million	135 per US\$/ha
5.2 Survey and Design Costs (5 % of Item 5.3 (1))	Rp.	3,260 million	298 per US\$/ha
5.3 Construction Cost			
		TOTAL NET AREA	6,185 HA
(1) Direct construction cost			
(i) Irrigation and drainage facilities	Rp.	45,100 million	4,120 per US\$/ha
(ii) Flood prevention works	Rp.	11,500 million	1,050 per US\$/ha
(iii) On-farm and land reclamation	Rp.	8,600 million	786 per US\$/ha
Sub-total (1)	Rp.	65,200 million	5,956 per US\$/ha
(2) Physical contingency (30 % of Item (1))	Rp.	19,560 million	1,787 per US\$/ha
(3) Sub-total of Items (1)+(2)	Rp.	84,760 million	7,742 per US\$/ha
(4) Tax on Civil Works(VAT) (10 % of Item 5.3-(3))	Rp.	8,476 million	774 per US\$/ha
Total of Item 5.3	Rp.	84,760 million	7,742 per US\$/ha
5.4 Cost of the Consultants Services (10 % of total cost of Item 5.3-(1))	Rp.	6,520 million	596 per US\$/ha
5.5 Administration Cost of the Government (1 % of total cost of Item 5.3)	Rp.	848 million	77 per US\$/ha
5.6 Price contingency	Rp.	0 million	0 per US\$/ha
5.7 Total Cost of the Project	Rp.	96,871 million	8,849 per US\$/ha

## VI. IMPLEMENTATION SCHEDULE

6.1 Survey and design	2 Years
6.2 Construction schedule	4 Years
6.3 Executing agency	DGWRD-DPU

## VII. PROJECT EVALUATION

7.1 Project Economic Cost	Rp.	77,715 million
7.2 Project Annual Economic Benefit		
(1) Irrigation development	Rp.	10,300 million
(2) Flood protection works	Rp.	800 million
7.3 Economic viability		
	EIRR:	12.2 %
	B/C :	1.21 (at 10 %)





## II. PRESENT CONDITIONS OF THE PROJECT AREA

### 2.1 Socio-economic Conditions in 1988

(1) Total population	54,300 persons
(2) Number of farm household	10,600 nos
(3) Family size(average)	5.1 persons
(4) Land holding size (average)	1.6 ha/farm household
(5) Income level(average)	Rp. 0.76 mil./household/year

### 2.2 Natural Conditions

(1) Soil condition	:	Fine textured soils and organic soils (peat)
(2) Topography	:	Flat
(3) Altitude	:	El. 7-2 m
(4) Annual rainfall	:	2,435 mm/year
(5) 5-year low rainfall	:	2,134 mm/year

### 2.3 Agricultural Activities

#### (1) Cropping area and unit yield of Paddy

Sub-area	WP	DP	RP	Total
(Cropping area, ha)				
	50	30	15,880	15,960

(Unit yield, ton/ha)

	5.0	5.0	2.0
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WP: Irrigated Wet Season Paddy      RP: Rainfed paddy field  
DP: Irrigated Dry Season Paddy

- (2) Use of fertilizer : Limited  
(3) Use of chemicals : Common  
(4) Use of farm machinery : Non

#### (5) Present land use (ha in Gross)

Sub-area	Irrigated Sawah	Rainfed Sawah	Swamp area	Others	Total
(PU area)					
1 DP Lebah	50	3,150	3,000	0	6,200
2 DP Leidong	0	13,400	2,600	0	16,000
(Non-PU area)					
3 Sei Payuh	0	3,300	4,100	0	7,400
4 Kupayang swamp	0	0	12,000	0	12,000
5 Leidong Left Swamp	0	0	11,500	0	11,500
6 Leidong Right Swamp	0	0	9,000	0	9,000
<b>Total</b>	<b>50</b>	<b>19,850</b>	<b>42,200</b>	<b>0</b>	<b>62,100</b>

## 2.4 Existing Infrastructure

## (1) Irrigation and drainage facilities

Sub-area	Irrigation canal (km)	Drainage canal (km)	Farm road (km)	Flood dike (km)	Related structures (nos)
DP Lebah	1.5	1.0	0.0	0.0	5.0
DP Leidong	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>1.5</b>	<b>1.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.0</b>

(2) Domestic water supply \_\_\_\_\_

(3) Electric supply \_\_\_\_\_

(4) Other key facilities \_\_\_\_\_

## 2.5 Flood Conditions

- (1) Area affected by flood : 10,300 ha  
(standing water depth more than 30 cm for more than 1 day)
- (2) Degree of flood :
- (i) Average stand. water depth : 0.6 m
- (ii) Average duration : 7 days

## III. MAIN CONSTRAINTS OF THE AREA

- (#) Lack of irrigation water supply
- (#) Suffered by seasonal river flooding
- (#) Pest and diseases
- (#) Poor drainability
- (#) Others, if any ; Poor Accessibility

## IV. PROPOSED DEVELOPMENT PLAN

## 4.1 Agricultural Development Plan

## (1) Land use plan

Present land use	Land Use Plan				Total
	Net Irrigated Sawah	Net Rainfed Sawah	Oil Palm	Others*	
Irr. Sawah	50	-	-	-	50
Rainfed Sawah	15,880	-	-	3,970	19,850
Oil Palm	0	-	-	-	0
Swamp	870	-	28,810	12,520	42,200
Others	0	-	-	-	0
<b>Total</b>	<b>19,600</b>		<b>28,810</b>	<b>16,490</b>	<b>62,100</b>

\* Others includes canals, roads, house yard, etc.

- (2) Cropping pattern : Double cropping of paddy in Irrigated Sawah  
Oil Palm Planting in reclaimed area from swamp
- (3) Cropping intensity : 200 % (Paddy field)
- (4) Target yield
- (i) Wet season paddy : 5.0 ton/ha
  - (ii) Dry season paddy : 5.0 ton/ha
  - (iii) Other crop( Oil Palm ) : 22 ton/ha/year

## 4.2 Related development plan

- (1) Development plan of DPU in Pelita V  
- Non -
- (2) Transmigration program
- (i) Objective area 870 ha in net paddy field and 28,800 ha in net of oil Palm land
  - (ii) Numbers of transmigrates ; 15,200 families
- (3) River improvement works
- (i) The design of flood prevention dike of the Lebah river has been completed in June 1989 under the urgent flood control project for the Asahan river.

## 4.3 Proposed Project Works

## (1) Principal Features of Project Works

( i ) Irrigation system		
- Water source development	Asahan River	
- Diversion structure	Asahan weir	
- Irrigation canals	New: 772 km,	Is Improved: 1 km
( ii ) Drainage canals	New: 1,112 km,	Is Improved: 24 km
( iii ) Flood protection dike	New: 29 km,	Is Improved: 0 km
( iv ) Farm road	New: 1,884 km,	Is Improved: 25 km
( v ) On-farm facilities	45,610 ha	
( vi ) Land reclamation of swamp area	29,680 ha	
( ) Others;		

## V. PROJECT COST ESTIMATE (FINANCIAL COST)

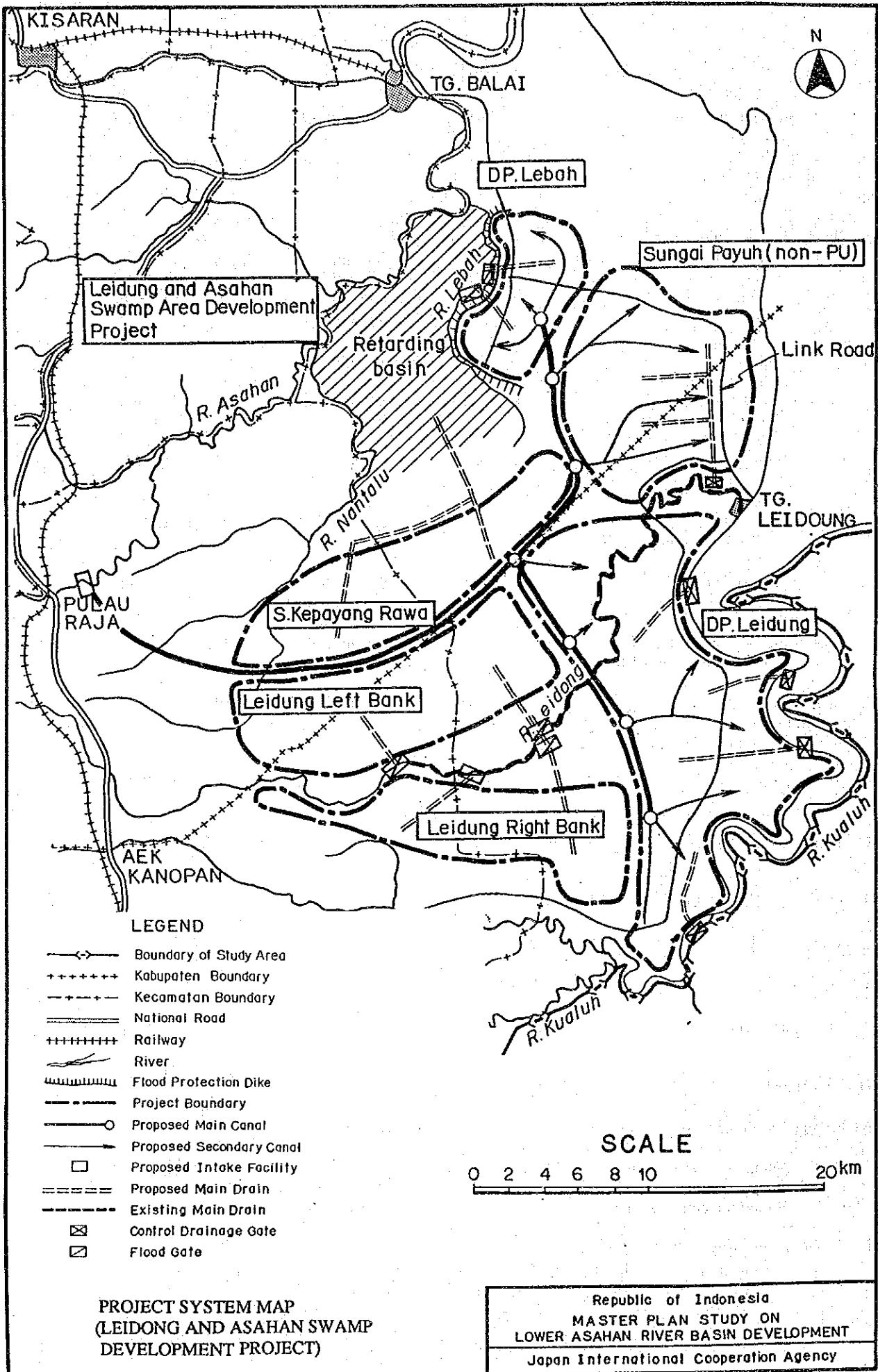
5.1 Land and Compensation Cost	Rp.	5,536 million	186 per US\$/ha
5.2 Survey and Design Costs (5 % of Item 5.3 (1))	Rp.	22,265 million	749 per US\$/ha
5.3 Construction Cost			
		<b>TOTAL IRRI. NET AREA</b>	<b>16,800 HA</b>
(1) <b>Direct construction cost</b>			
(i) Irrigation and drainage facilities	Rp.	215,100 million	7,233 per US\$/ha
(ii) Flood prevention works	Rp.	8,200 million	276 per US\$/ha
(iii) On-farm and land reclamation	Rp.	128,500 million	4,321 per US\$/ha
(iv) Trunk roads	Rp.	93,500 million	3,144 per US\$/ha
Sub-total (1)	Rp.	445,300 million	14,975 per US\$/ha
(2) Physical contingency (30 % of Item (1))	Rp.	133,590 million	4,493 per US\$/ha
(3) Sub-total of Items (1)+(2)	Rp.	578,890 million	19,468 per US\$/ha
(4) Tax on Civil Works(VAT) (10 % of Item 5.3-(3))	Rp.	57,889 million	1,947 per US\$/ha
Total of Item 5.3	Rp.	578,890 million	19,468 per US\$/ha
5.4 Cost of the Consultants Services (10 % of total cost of Item 5.3-(1))	Rp.	44,530 million	1,498 per US\$/ha
5.5 Administration Cost of the Government (1 % of total cost of Item 5.3)	Rp.	5,789 million	195 per US\$/ha
5.6 Price contingency	Rp.	0 million	0 per US\$/ha
5.7 Total Cost of the Project	Rp.	657,010 million	22,095 per US\$/ha

## VI. IMPLEMENTATION SCHEDULE

6.1 Survey and design	4 Years
6.2 Construction schedule	12 Years
6.3 Executing agency	DGWRD-DPU

## VII. PROJECT EVALUATION

7.1 Project Economic Cost	Rp.	521,180 million
7.2 Project Annual Economic Benefit		
(1) Irrigation development	Rp.	83,999 million
(2) Flood protection works	Rp.	623 million
7.3 Economic viability		
EIRR:		8.5 %
B/C :		0.8 (at 10 %)





## PROJECT DESCRIPTION SHEET

### I. SUMMARY

1.1 Name of Project : **KANOPAN LEFT BANK DRAINAGE IMPROVEMENT PROJECT**

1.2 Type of Project : Drainage improvement / Swamp development

1.3 Location:           Kabupaten:       L.Batu  
  Kecamatan :     Kualuh Hulu

1.4 Project Area :       **5,800** ha in gross

1.5 Proposed Agricultural Development Plan

- Proposed cropping pattern       Single crop of paddy a year
- Cropping intensity                100 %
- Irrigation area                    4,300 ha in net
- Non irrigation area               1,500 ha

1.6 Proposed Key Facilities

- i) Flood control and drainage improvement of existing paddy area by constructing a flood prevention dike and drainage canals with control structures.
- ii) Land reclamation of swamp land
- iii) Betterment of accessibility in the project area by constructing road net work

1.7 Project Financial Cost                        Rp. 26,000 million  
(Price contingency is not included)

1.8 Economic Annual                               Rp. 2,630 million  
Incremental Project Benefit

1.9 Economic Viability                        EIRR:       11.3 %  
  B/C:       1.14 at 10 % interest rate

1.10 Proposed Implementation Period :       5 years  
(including study, design and fund arrangement period)

## II. PRESENT CONDITIONS OF THE PROJECT AREA

### 2.1 Socio-economic Conditions in 1988

(1) Total population	5,300 persons
(2) Number of farm household	1,000 nos
(3) Family size(average)	5.2 persons
(4) Land holding size (average)	1.8 ha/farm household
(5) Income level(average)	Rp. 0.76 mil./household/year

### 2.2 Natural Conditions

(1) Soil condition	:	Fine textured soils, partly covered with peat and peat soil
(2) Topography	:	Flat
(3) Altitude	:	El. 12-2 m
(4) Annual rainfall	:	2,630 mm/year
(5) 5-year low rainfall	:	2,219 mm/year

### 2.3 Agricultural Activities

#### (1) Cropping area and unit yield of Paddy

Sub-area	WP	DP	RP	Total
(Cropping area, ha)	-	-	2,064	2,064

(Unit yield, ton/ha)	-	-	2.0	
----------------------	---	---	-----	--

WP: Irrigated Wet Season Paddy      RP: Rainfed paddy field  
 DP: Irrigated Dry Season Paddy

- (2) Use of fertilizer : Limited  
 (3) Use of chemicals : Common  
 (4) Use of farm machinery : Non

#### (5) Present land use (ha in Gross)

Sub-area	Irrigated Sawah	Rainfed Sawah	Swamp area	Others	Total
(PU area)					
1 DP Suka Rame Suka Sari	0	950	550	0	1,500
2 DP Sono Martani	0	780	2,220	0	3,000
(Non-PU area)					
3 Lower Sono Martani	0	850	450	0	1,300
<b>Total</b>	<b>0</b>	<b>2,580</b>	<b>3,220</b>	<b>0</b>	<b>5,800</b>

## 2.4 Existing Infrastructure

## (1) Irrigation and drainage facilities

Sub-area	Irrigation canal (km)	Drainage canal (km)	Farm road (km)	Flood dike (km)	Related structures (nos)
1. DP. Suka Rame/Sar :	0	6.0	0	0	0
2. DP. Sono Martani :	0	44.6	0	0	0
<b>Total</b>	<b>0</b>	<b>50.6</b>	<b>0</b>	<b>0</b>	<b>0</b>

(2) Domestic water supply \_\_\_\_\_

(3) Electric supply \_\_\_\_\_

(4) Other key facilities \_\_\_\_\_

## 2.5 Flood Conditions

- (1) Area affected by flood : 4,400 ha  
(standing water depth more than 30 cm for more than 1 day)
- (2) Degree of flood :
- (i) Average stand. water depth : 0.5 m
- (ii) Average duration : 7 days

## III. MAIN CONSTRAINTS OF THE AREA

- ( ) Lack of irrigation water supply
- (#) Suffered by seasonal river flooding
- ( ) Pest and diseases
- (#) Poor drainability
- ( ) Others, if any \_\_\_\_\_

## IV. PROPOSED DEVELOPMENT PLAN

## 4.1 Agricultural Development Plan

## (1) Land use plan

Present land use	Land Use Plan				Total
	Net Irrigated Sawah	Net Rainfed Sawah	Oil Palm	Others*	
Irri. Sawah	-	-	-	-	0
Rainfed Sawah	-	2,064	-	516	2,580
Swamp	-	2,256	-	964	3,220
Others	-	-	-	-	0
<b>Total</b>	<b>0</b>	<b>4,320</b>		<b>1,480</b>	<b>5,800</b>

\* Others includes canals, roads, house yard, etc.

(2) Cropping pattern : Single cropping of paddy a year

(3) Cropping intensity : 100 %

(4) Target yield

(i) Wet season paddy :	4.0 ton/ha
(ii) Dry season paddy :	- ton/ha
(iii) Other crop :	- ton/ha

## 4.2 Related development plan

(1) Development plan of DPU in Pelita V  
- Non -

(2) Transmigration program  
(i) Objective area : 2,250 ha in net  
(ii) Numbers of transmigrates ; 2,200 families

(3) River improvement works  
- Non -

## 4.3 Proposed Project Works

(1) Principal Features of Project Works

( i ) Drainage canals	New:	85 km,	Improved:	0 km
( ii ) Flood protection dike	New:	11 km,	Improved:	0 km
( iii ) Farm road	New:	85 km,	Improved:	0 km
( iv ) On-farm facilities		4,320 ha		
( v ) Land reclamation of swamp area		2,260 ha		

( ) Others: \_\_\_\_\_

## V. PROJECT COST ESTIMATE (FINFANCIAL COST)

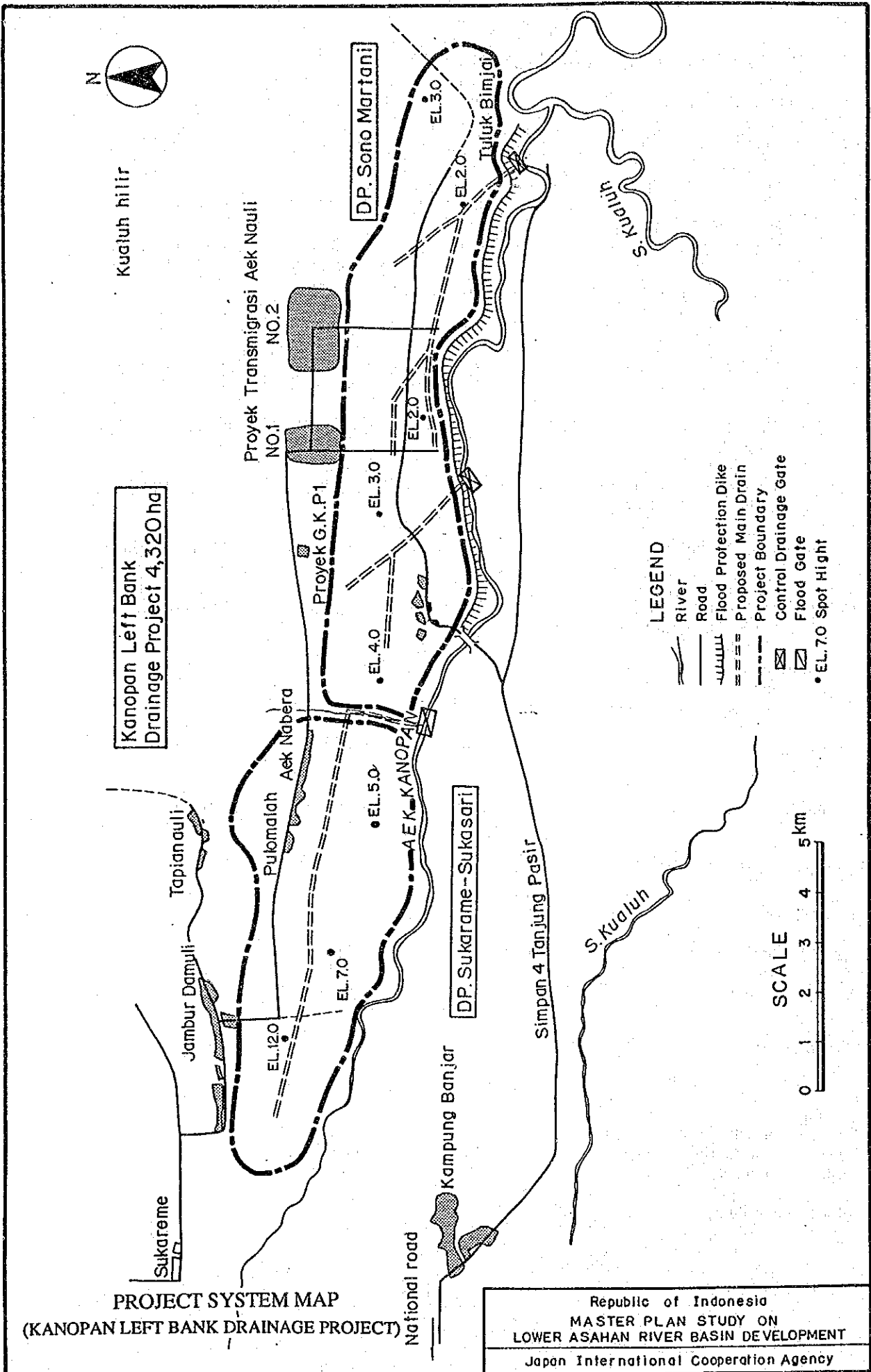
5.1 Land and Compensation Cost	Rp.	419 million	55 per US\$/ha
5.2 Survey and Design Costs (5 % of Item 5.3 (1))	Rp.	865 million	113 per US\$/ha
5.3 Construction Cost			
		TOTAL IRRRI. NET ARI	4,320 HA
(1) Direct construction cost			
(i) Drainage facilities	Rp.	8,100 million	1,059 per US\$/ha
(ii) Flood prevention works	Rp.	3,300 million	432 per US\$/ha
(iii) On-farm work and land reclamati	Rp.	5,900 million	772 per US\$/ha
Sub-total (1)	Rp.	17,300 million	2,263 per US\$/ha
(2) Physical contingency (30 % of Item (1))	Rp.	5,190 million	679 per US\$/ha
(3) Sub-total of Items (1)+(2)	Rp.	22,490 million	2,941 per US\$/ha
(4) Tax on Civil Works(VAT) (10 % of Item 5.3-(3))	Rp.	2,249 million	294 per US\$/ha
Total of Item 5.3	Rp.	22,490 million	2,941 per US\$/ha
5.4 Cost of the Consultants Services (10 % of total cost of Item 5.3-(1))	Rp.	1,730 million	226 per US\$/ha
5.5 Administration Cost of the Government (1 % of total cost of Item 5.3)	Rp.	225 million	29 per US\$/ha
5.6 Price contingency	Rp.	0 million	0 per US\$/ha
5.7 Total Cost of the Project	Rp.	25,729 million	3,365 per US\$/ha

## VI. IMPLEMENTATION SCHEDULE

6.1 Survey and design	2 Years
6.2 Construction schedule	3 Years
6.3 Executing agency	DGWRD-DPU

## VII. PROJECT EVALUATION

7.1 Project Economic Cost	Rp.	20,250 million
7.2 Project Annual Economic Benefit		
(1) Irrigation development	Rp.	2,640 million
(2) Flood protection works	Rp.	464 million
7.3 Economic viability		
	EIRR:	11.3 %
	B/C :	1.14 (at 10 %)



**PROJECT SYSTEM MAP**  
**(KANOPAN LEFT BANK DRAINAGE PROJECT)**

Republic of Indonesia  
 MASTER PLAN STUDY ON  
 LOWER ASAHAN RIVER BASIN DEVELOPMENT  
 Japan International Cooperation Agency



## II. PRESENT CONDITIONS OF THE PROJECT AREA

### 2.1 Socio-economic Conditions in 1988

(1)	Total population		4,800 persons
(2)	Number of farm household		930 nos
(3)	Family size(average)		5.2 persons
(4)	Land holding size (average)		1.8 ha/farm household
(5)	Income level(average)	Rp.	0.76 mil./household/year

### 2.2 Natural Conditions

(1)	Soil conditions	:	Medium to fine textured soils and peat soils
(2)	Topography	:	Flat
(3)	Altitude	:	El. 10-5 m
(4)	Annual rainfall	:	2,751 mm/year
(5)	5-year low rainfall	:	2,258 mm/year

### 2.3 Agricultural Activities

#### (1) Cropping area and unit yield of Paddy

Sub-area	WP	DP	RP	Total
(Cropping area, ha)			2,704	2,704

(Unit yield, ton/ha)

2.0

WP: Irrigated Wet Season Paddy      RP: Rainfed paddy field  
 DP: Irrigated Dry Season Paddy

- (2) Use of fertilizer : Limited  
 (3) Use of chemicals : Common  
 (4) Use of farm machinery : Non

#### (5) Present land use (ha in Gross)

Sub-area	Irrigated Sawah	Rainfed Sawah	Swamp area	Others	Total
(PU area)					
1 DP Aek Natas	0	2,540	1,610	350	4,500
2 DP Tampilan Nauli	0	840	110	50	1,000
<b>Total</b>	<b>0</b>	<b>3,380</b>	<b>1,720</b>	<b>400</b>	<b>5,500</b>



## 2.4 Existing Infrastructure

## (1) Irrigation and drainage facilities

Sub-area	Irrigation canal (km)	Drainage canal (km)	Farm road (km)	Flood dike (km)	Related structures (nos)
1. D.P. Aek Natas	0.0	10.7	0.0	15.0	0.0
2. D.P. Tapiav Naul	0.0	16.0	0.0	0.0	0.0
<b>Total</b>	<b>0.0</b>	<b>26.7</b>	<b>0.0</b>	<b>15.0</b>	<b>0.0</b>

(2) Domestic water supply \_\_\_\_\_

(3) Electric supply \_\_\_\_\_

(4) Other key facilities \_\_\_\_\_

## 2.5 Flood Conditions

(1) Area affected by flood : 4,400 ha  
(standing water depth more than 30 cm for more than 1 day)

(2) Degree of flood

(i) Average stand. water depth : 0.5 m

(ii) Average duration : 7 days

## III. MAIN CONSTRAINTS OF THE AREA

- (#) Lack of irrigation water supply
- (#) Suffered by seasonal river flooding
- ( ) Pest and diseases
- (#) Poor drainability
- ( ) Others, if any ; Poor accessibility

## IV. PROPOSED DEVELOPMENT PLAN

## 4.1 Agricultural Development Plan

## (1) Land use plan

Present land use	Land Use Plan				Total
	Net Irrigated Sawah	Net Rainfed Sawah	Oil Palm	Others*	
Irr. Sawah	-	-	-	-	0
Rainfed Sawah	2,704	-	-	676	3,380
Swamp	1,206	-	-	514	1,720
Others	280	-	-	120	400
<b>Total</b>	<b>4,190</b>	<b>0</b>	<b>0</b>	<b>1,310</b>	<b>5,500</b>

\* Others includes canals, roads, house yard, etc.

(2) Cropping pattern : Double crop of paddy a year

(3) Cropping intensity : 200 %

(4) Target yield

(i) Wet season paddy : 5.0 ton/ha  
(ii) Dry season paddy : 5.0 ton/ha  
(iii) Other crop : - ton/ha

## 4.2 Related development plan

(1) Development plan of DPU in Pelita V  
- Non -

(2) Transmigration program  
(i) Objective area : 1,200 ha in net  
(ii) Numbers of transmigrates ; 1,200 families

(3) River improvement works  
- Non -

## 4.3 Proposed Project Works

(1) Principal Features of Project Works

( i ) Irrigation system

- Water source development  
- Diversion structure  
- Irrigation canals

Natas River

Natas Weir

( ii ) Drainage canals

( iii ) Flood protection dike

( iv ) Farm road

( v ) On-farm facilities

( vi ) Land reclamation of swamp area

New:	147 km,	Improved:	0 km
New:	78 km,	Improved:	8 km
New:	16 km,	Improved:	0 km
New:	225 km,	Improved:	8 km
	4,190 ha		
	1,490 ha		

( ) Others; \_\_\_\_\_

## V. PROJECT COST ESTIMATE (FINANCIAL COST)

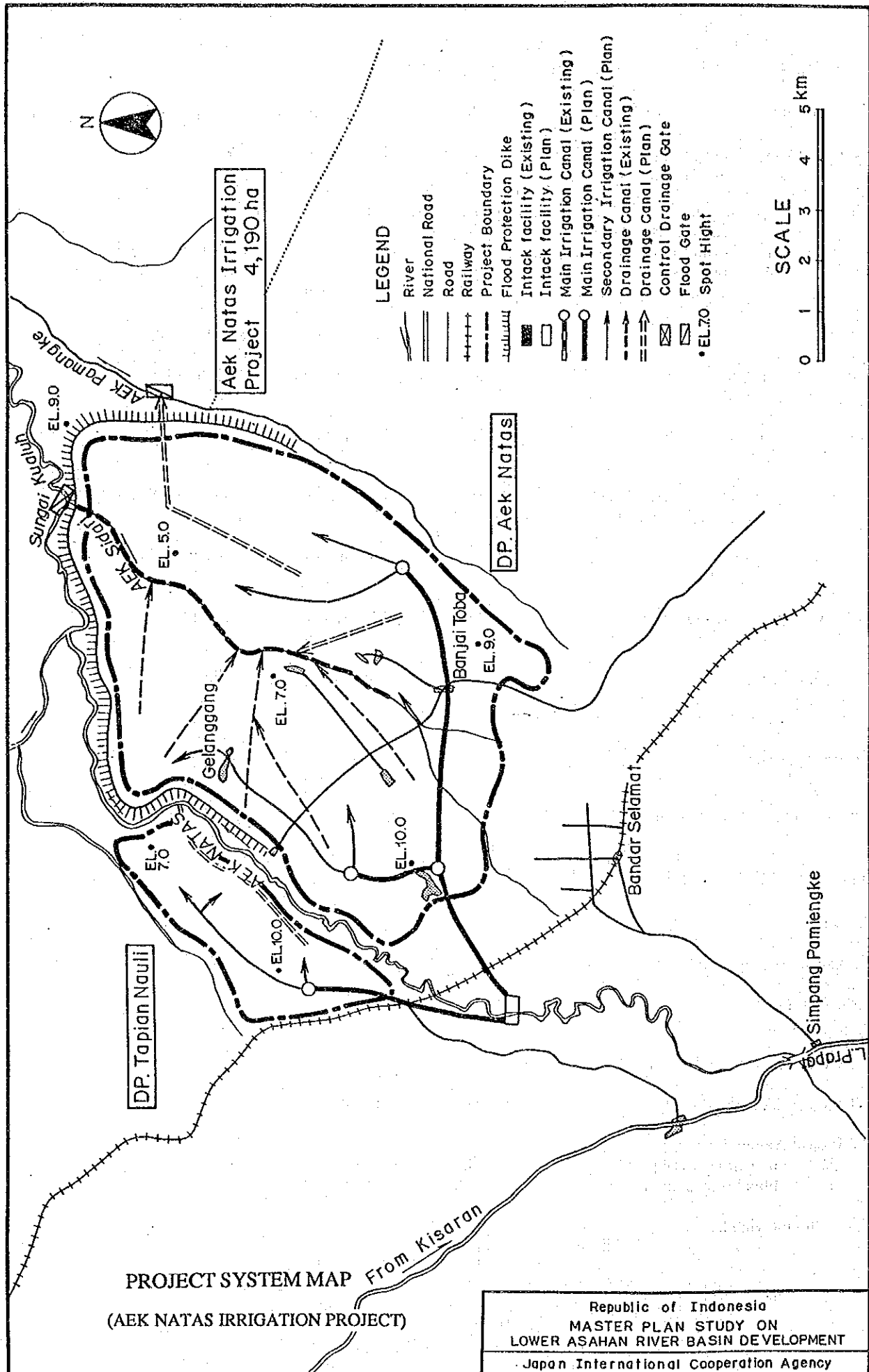
5.1 Land and Compensation Cost	Rp.	1,782 million	240 per US\$ ha
5.2 Survey and Design Costs (5 % of Item 5.3 (1))	Rp.	2,130 million	287 per US\$ ha
5.3 Construction Cost			
		<b>TOTAL IRRI. NET AREA</b>	<b>4,190 HA</b>
(1) <b>Direct construction cost</b>			
(i) Irrigation and drainage facilities	Rp.	30,300 million	4,086 per US\$ /ha
(ii) Flood prevention works	Rp.	6,800 million	917 per US\$ /ha
(iii) On-farm and land reclamation	Rp.	5,500 million	741 per US\$ /ha
Sub-total (1)	Rp.	42,600 million	5,744 per US\$ ha
(2) <b>Physical contingency</b> (30 % of Item (1))	Rp.	12,780 million	1,723 per US\$ ha
(3) Sub-total of Items (1)+(2)	Rp.	55,380 million	7,467 per US\$ ha
(4) Tax on Civil Works(VAT) (10 % of Item 5.3-(3))	Rp.	5,538 million	747 per US\$ ha
Total of Item 5.3	Rp.	55,380 million	7,467 per US\$ ha
5.4 Cost of the Consultants Services (10 % of total cost of Item 5.3-(1))	Rp.	4,260 million	574 per US\$ ha
5.5 Administration Cost of the Government (1 % of total cost of Item 5.3)	Rp.	554 million	75 per US\$ ha
5.6 Price contingency	Rp.	0 million	0 per US\$ ha
<b>5.7 Total Cost of the Project</b>	Rp.	<b>64,106 million</b>	<b>8,644 per US\$ ha</b>

## VI. IMPLEMENTATION SCHEDULE

6.1 Survey and design	2 Years
6.2 Construction schedule	3 Years
6.3 Executing agency	DGWRD-DPU

## VII. PROJECT EVALUATION

7.1 Project Economic Cost	Rp.	49,860 million
7.2 Project Annual Economic Benefit		
(1) Irrigation development	Rp.	6,970 million
(2) Flood protection works	Rp.	482 million
7.3 Economic viability		
	EIRR:	11.2 %
	B/C :	1.12 (at 10 %)





## II. PRESENT CONDITIONS OF THE PROJECT AREA

### 2.1 Socio-economic Conditions in 1988

(1) Total population	3,100 persons
(2) Number of farm household	590 nos
(3) Family size(average)	5.2 persons
(4) Land holding size (average)	1.4 ha/farm household
(5) Income level(average)	Rp. 0.76 mil./household/year

### 2.2 Natural Conditions

(1) Soil conditions	: Medium textured soils
(2) Topography	: Flat
(3) Altitude	: El. 10-6 m
(4) Annual rainfall	: 2630 mm/year
(5) 5-year low rainfall	: 2219 mm/year

### 2.3 Agricultural Activities

#### (1) Cropping area and unit yield of Paddy

Sub-area	WP	DP	RP	Total
(Cropping area, ha)			2,040	2,040

(Unit yield, ton/ha)

	2.0
--	-----

WP: Irrigated Wet Season Paddy      RP: Rainfed paddy field  
 DP: Irrigated Dry Season Paddy

- (2) Use of fertilizer : Limited  
 (3) Use of chemicals : Common  
 (4) Use of farm machinery : Non

#### (5) Present land use (ha in Gross)

Sub-area	Irrigated Sawah	Rainfed Sawah	Swamp area	Others	Total
(Non-PU area)					
2 Kp.Saga	0	2,550	550	0	3,100
<b>Total</b>	<b>0</b>	<b>2,550</b>	<b>550</b>	<b>0</b>	<b>3,100</b>

## 2.4 Existing Infrastructure

## (1) Irrigation and drainage facilities

Sub-area	Irrigation canal (km)	Drainage canal (km)	Farm road (km)	Flood dike (km)	Related structures (nos)
----------	--------------------------	------------------------	-------------------	--------------------	-----------------------------

- Non -

(2) Domestic water supply \_\_\_\_\_

(3) Electric supply \_\_\_\_\_

(4) Other key facilities \_\_\_\_\_

## 2.5 Flood Conditions

- (1) Area affected by flood : 3,000 ha  
(standing water depth more than 30 cm for more than 1 day)
- (2) Degree of flood :
- (i) Average stand. water depth : 0.5 m
- (ii) Average stand. water depth : 7 days

## III. MAIN CONSTRAINTS OF THE AREA

- (#) Lack of irrigation water supply
- (#) Suffered by seasonal river flooding
- ( ) Pest and diseases
- ( ) Poor drainability
- (#) Others, if any ; Lack of irrigation facilities

## IV. PROPOSED DEVELOPMENT PLAN

## (1) Land use plan

Present land use	Land Use Plan				Total
	Net Irrigated Sawah	Net Rainfed Sawah	Oil Palm	Others*	
Irr. Sawah	-	-	-	-	0
Rainfed Sawah	2,040	-	-	510	2,550
Swamp	385	-	-	165	550
Others	0	-	-	0	0
<b>Total</b>	<b>2,425</b>	<b>0</b>	<b>0</b>	<b>675</b>	<b>3,100</b>

\* Others includes canals, roads, house yard, etc.

(2) Cropping pattern : Double crop of paddy

(3) Cropping intensity : 200 %

(4) Target yield

(i) Wet season paddy :	5 ton/ha
(ii) Dry season paddy :	5 ton/ha
(iii) Other crop :	ton/ha

## 4.2 Related development plan

(1) Development plan of DPU in Pelita V  
- Non -

(2) Transmigration program  
(i) Objective area : 380 ha in net  
(ii) Numbers of transmigrates ; 300 families

(3) River improvement works  
- Non -

## 4.3 Proposed Project Works

## (1) Principal Features of Project Works

	Kualuh River	
	Kualuh No.1 Weir (Upstream)	
(i) Irrigation system		
- Water source development	New: 85 km,	Improved: 0 km
- Diversion structure	New: 61 km,	Improved: 0 km
- Irrigation canals	New: 19 km,	Improved: 0 km
(ii) Drainage canals	New: 146 km,	Improved: 0 km
(iii) Flood protection dike		
(iv) Farm road		
(v) On-farm facilities	2,425 ha	
(vi) Land reclamation of swamp area	385 ha	
( ) Others;	_____	



## V. PROJECT COST ESTIMATE (FINANCIAL COST)

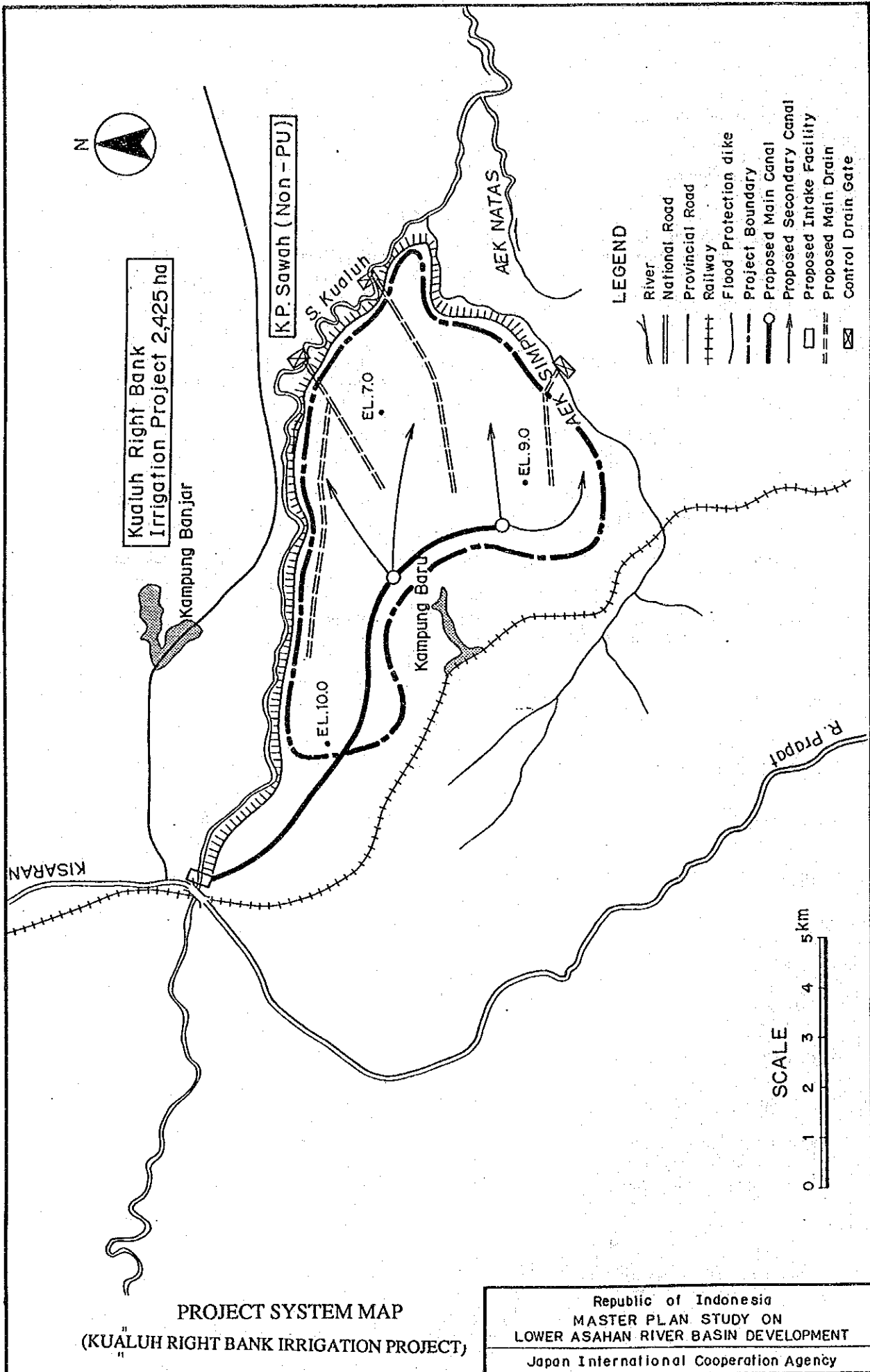
5.1 Land and Compensation Cost	Rp.	1,156 million	269 per US\$/ha
5.2 Survey and Design Costs (5 % of Item 5.3 (1))	Rp.	1,345 million	313 per US\$/ha
5.3 Construction Cost			
		TOTAL IRRI. NET AREA	2,425 HA
(1) Direct construction cost			
(i) Irrigation and drainage facilities	Rp.	20,500 million	4,776 per US\$/ha
(ii) Flood prevention works	Rp.	3,400 million	792 per US\$/ha
(iii) On-farm and land reclamation	Rp.	3,000 million	699 per US\$/ha
Sub-total (1)	Rp.	26,900 million	6,267 per US\$/ha
(2) Physical contingency (30 % of Item (1))	Rp.	8,070 million	1,880 per US\$/ha
(3) Sub-total of Items (1)+(2)	Rp.	34,970 million	8,147 per US\$/ha
(4) Tax on Civil Works(VAT) (10 % of Item 5.3-(3))	Rp.	3,497 million	815 per US\$/ha
Total of Item 5.3	Rp.	34,970 million	8,147 per US\$/ha
5.4 Cost of the Consultants Services (10 % of total cost of Item 5.3-(1))	Rp.	2,690 million	627 per US\$/ha
5.5 Administration Cost of the Government (1 % of total cost of Item 5.3)	Rp.	350 million	81 per US\$/ha
5.6 Price contingency	Rp.	0 million	0 per US\$/ha
5.7 Total Cost of the Project	Rp.	40,511 million	9,438 per US\$/ha

## VI. IMPLEMENTATION SCHEDULE

6.1 Survey and design	2 Years
6.2 Construction schedule	3 Years
6.3 Executing agency	DGWRD-DPU

## VII. PROJECT EVALUATION

7.1 Project Economic Cost	Rp.	31,485 million
7.2 Project Annual Economic Benefit		
(1) Irrigation development	Rp.	3,930 million
(2) Flood protection works	Rp.	302 million
7.3 Economic viability		
	EIRR:	10.1 %
	B/C :	1.01 (at 10 %)



## PROJECT DESCRIPTION SHEET

### I. SUMMARY

1.1 Name of Project : **AEK NAETEK IRRIGATION PROJECT**

1.2 Type of Project : Irrigation and drainage development / Swamp development

1.3 Location: Kabupaten: L. Batu  
Kecamatan : Kaluh Hulu, Kualuh Hilir

1.4 Project Area : **4,500** ha in gross

1.5 Proposed Agricultural Development Plan

- Proposed cropping pattern Double cropping of paddy
- Cropping intensity 200 %
- Irrigation area 3,500 ha in net
- Non irrigation area 1,000 ha

1.6 Proposed Key Facilities

- i) Irrigation development by constructing a diversion structure on the Kualuh river and an irrigation canal network.
- ii) Drainage improvement of the low-lying area by constructing drainage canals with tidal control structures, and flood prevention dikes.
- iii) Land reclamation of swamp area.
- iv) Construction of farm road network in the area

1.7 Project Financial Cost Rp.59,000 million  
(Price contingency is not included)

1.8 Economic Annual Incremental Project Benefit Rp. 5,760 million

1.9 Economic Viability EIRR: 11.3 %  
B/C: 1.13 at 10% interest rate

1.10 Proposed Implementation Period : 5 years  
(including study, design and fund arrangement period)

## II. PRESENT CONDITIONS OF THE PROJECT AREA

### 2.1 Socio-economic Conditions in 1988

(1) Total population	2,100 persons
(2) Number of farm household	410 nos
(3) Family size(average)	5.1 persons
(4) Land holding size (average)	1.4 ha/farm household
(5) Income level(average)	Rp. 0.76 mil./household/year

### 2.2 Natural Conditions

(1) Soil condition	:	Fine textured soils and peat soil
(2) Topography	:	Flat
(3) Altitude	:	EI 7-3 m
(4) Annual rainfall	:	2,630 mm/year
(5) 5-year low rainfall	:	2,218 mm/year

### 2.3 Agricultural Activities

#### (1) Cropping area and unit yield of Paddy

Sub-area	WP	DP	RP	Total
(Cropping area, ha)			2,400	2,400

(Unit yield, ton/ha)			2.0	2.0
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WP: Irrigated Wet Season Paddy      RP: Rainfed paddy field  
 DP: Irrigated Dry Season Paddy

- (2) Use of fertilizer : Limited  
 (3) Use of chemicals : Common  
 (4) Use of farm machinery : Non  
 (5) Present land use (ha in Gross)

Sub-area	Irrigated Sawah	Rainfed Sawah	Swamp area	Others	Total
DP Aek Naetek	0	3,000	1,500	0	4,500
<b>Total</b>	<b>0</b>	<b>3,000</b>	<b>1,500</b>	<b>0</b>	<b>4,500</b>

## 2.4 Existing Infrastructure

## (1) Irrigation and drainage facilities

Sub-area	Irrigation canal (km)	Drainage canal (km)	Farm road (km)	Flood dike (km)	Related structures (nos)
DP Ack Naetek	0	15.6	0	36.5	0

- (2) Domestic water supply \_\_\_\_\_  
 (3) Electric supply \_\_\_\_\_  
 (4) Other key facilities \_\_\_\_\_

## 2.5 Flood Conditions

- (1) Area affected by flood : 3,000 ha  
 (standing water depth more than 30 cm for more than 1 day)  
 (2) Degree of flood :  
 (i) Average stand. water depth : 0.5 m  
 (ii) Average duration : 7 days

## III. MAIN CONSTRAINTS OF THE AREA

- (#) Lack of irrigation water supply  
 (#) Suffered by seasonal river flooding  
 (#) Pest and diseases  
 (#) Poor drainability  
 (#) Others, if any ; Poor Accessibility

## IV. PROPOSED DEVELOPMENT PLAN

## 4.1 Agricultural Development Plan

## (1) Land use plan

Present land use	Land Use Plan				Total
	Net Irrigated Sawah	Net Rainfed Sawah	Oil Palm	Others*	
Irr. Sawah					0
Rainfed Sawah	2,400			600	3,000
Swamp	1,050			450	1,500
Others					0
<b>Total</b>	<b>3,450</b>			<b>1,050</b>	<b>4,500</b>

\* Others includes canals, roads, house yard, etc.

(2) Cropping pattern : Double cropping of paddy

(3) Cropping intensity : 200 %

(4) Target yield

(i) Wet season paddy :	5.0 ton/ha
(ii) Dry season paddy :	5.0 ton/ha
(iii) Other crop :	ton/ha

## 4.2 Related development plan

(1) Development plan of DPU in Pelita V and VI  
- Non -

(2) Transmigration program  
(i) Objective area : 1,050 ha in net  
(ii) Numbers of transmigrates ; 1,000 families

(3) River improvement works  
- Non -

## 4.3 Proposed Project Works

## (1) Principal Features of Project Works

(i) Irrigation system		
- Water source development	Kualuh River	
- Diversion structure	Kualuh No.2 weir(downstream)	
- Irrigation canals	New: 121 km,	Improved: 0 km
(ii) Drainage canals	New: 71 km,	Improved: 15 km
(iii) Flood protection dike	New: 17 km,	Improved: 0 km
(iv) Farm road	New: 192 km,	Improved: 15 km
(v) On-farm facilities	3,450 ha	
(vi) Land reclamation of swamp area	1,050 ha	
( ) Others;	_____	

## V. PROJECT COST ESTIMATE (FINANCIAL COST)

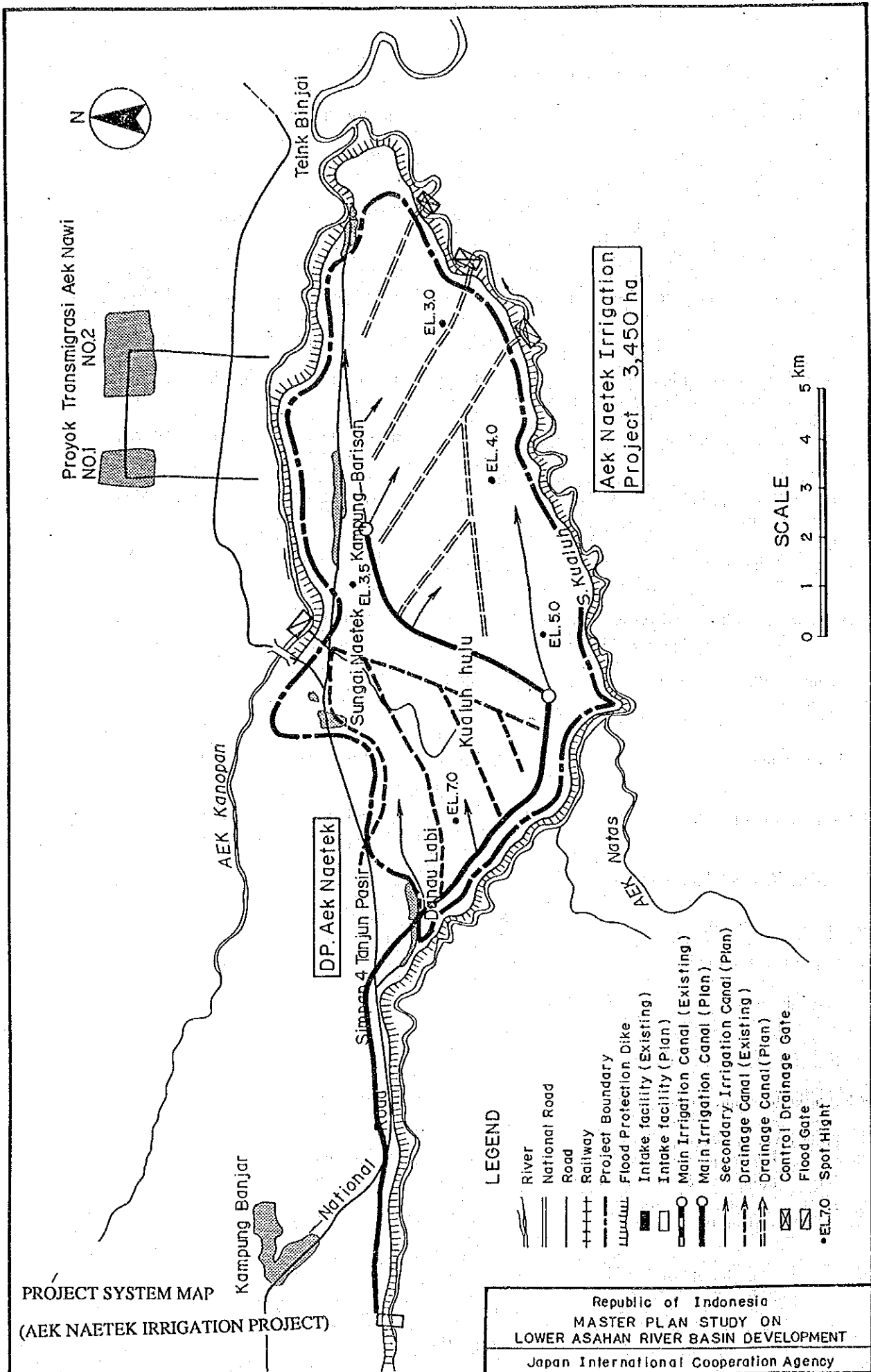
5.1 Land and Compensation Cost	Rp.	1,383 million	226 per US\$/ha
5.2 Survey and Design Costs (5 % of Item 5.3 (1))	Rp.	1,960 million	321 per US\$/ha
5.3 Construction Cost			
		<b>TOTAL IRRI. NET AREA</b>	<b>3,450 HA</b>
(1) <b>Direct construction cost</b>			
(i) Irrigation and drainage facilities	Rp.	27,700 million	4,537 per US\$/ha
(ii) Flood prevention works	Rp.	7,100 million	1,163 per US\$/ha
(iii) On-farm and land reclamation	Rp.	4,400 million	720 per US\$/ha
Sub-total (1)	Rp.	39,200 million	6,419 per US\$/ha
(2) <b>Physical contingency</b> (30 % of Item (1))	Rp.	11,760 million	1,926 per US\$/ha
(3) Sub-total of Items (1)+(2)	Rp.	50,960 million	8,345 per US\$/ha
(4) Tax on Civil Works(VAT) (10 % of Item 5.3-(3))	Rp.	5,096 million	835 per US\$/ha
Total of Item 5.3	Rp.	50,960 million	8,345 per US\$/ha
5.4 Cost of the Consultants Services (10 % of total cost of Item 5.3-(1))	Rp.	3,920 million	642 per US\$/ha
5.5 Administration Cost of the Government (1 % of total cost of Item 5.3)	Rp.	510 million	83 per US\$/ha
5.6 Price contingency	Rp.	0 million	0 per US\$/ha
<b>5.7 Total Cost of the Project</b>	Rp.	<b>58,733 million</b>	<b>9,618 per US\$/ha</b>

## VI. IMPLEMENTATION SCHEDULE

6.1 Survey and design	2 Years
6.2 Construction schedule	3 Years
6.3 Executing agency	DGWRD-DPU

## VII. PROJECT EVALUATION

7.1 Project Economic Cost	Rp.	45,880 million
7.2 Project Annual Economic Benefit		
(1) Irrigation development	Rp.	5,760 million
(2) Flood protection works	Rp.	802 million
7.3 Economic viability		
	EIRR:	11.3 %
	B/C :	1.13 (at 10 %)







## II. PRESENT CONDITIONS OF THE PROJECT AREA

### 2.1 Socio-economic Conditions in 1988

(1) Total population		12,500 persons
(2) Number of farm household		2,400 nos
(3) Family size(average)		5.2 persons
(4) Land holding size (average)		1.1 ha/farm household
(5) Income level(average)	Irrigated Area Rp.	1.2 mil./household/year
	Rainfed Area Rp.	0.8 mil./household/year

### 2.2 Natural Conditions

(1) Soil condition	:	Fine textured Alluvial soils in narrow valley bottom
(2) Topography	:	Valley bottom and flat
(3) Altitude	:	El. 50-10 m
(4) Annual rainfall	:	2,435 mm/year
(5) 5-year low rainfall	:	2,134 mm/year
(6) Drainage condition	:	Relatively good

### 2.3 Agricultural Activities

#### (1) Cropping area and unit yield of Paddy

Sub-area	WP	DP	RP	Total
(Cropping area, ha)	1,040	624	5,982	7,646

(Unit yield, ton/ha)	3.5	3.5	2.5
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WP: Irrigated Wet Season Paddy      RP: Rainfed paddy field  
 DP: Irrigated Dry Season Paddy

- (2) Use of fertilizer : Considerable in Irrigated area, common in Rainfed area  
 (3) Use of chemicals : Common  
 (4) Use of farm machinery : Non

#### (5) Present land use (ha in Gross)

Sub-area	Irrigated Sawah	Rainfed Sawah	Swamp area	Others	Total
(PU area)					
1 Irrigated small patches (11 patches)	1,155	1,760	0	0	2,915
(Non-PU area)					
3 Silau river basin	0	2,100	0	0	2,100
4 Bunut river basin	0	410	0	0	410
5 Upper Silau (A=>500 ha), X 2	0	1,255	0	0	1,255
6 Upper Kualuh (A=>500 ha), X 3	0	2,020	0	0	2,020
<b>Total</b>	<b>1,155</b>	<b>7,545</b>	<b>0</b>	<b>0</b>	<b>8,700</b>

## 2.4 Existing Infrastructure

## (1) Irrigation and drainage facilities

Sub-area	Irrigation canal (km)	Drainage canal (km)	Farm road (km)	Flood dike (km)	Related structures (nos)
1. PU in Kab. Asahan	38.6	3.5	0.0	0.0	41
1. PU in Kab. Lab. Batu	25.9	9.8	0.9	0.8	79
<b>Total</b>	<b>64.5</b>	<b>13.3</b>	<b>0.9</b>	<b>0.8</b>	<b>120</b>

(2) Domestic water supply \_\_\_\_\_

(3) Electric supply \_\_\_\_\_

(4) Other key facilities \_\_\_\_\_

## 2.5 Flood Conditions

(1) Area affected by flood : - ha  
(standing water depth more than 30 cm for more than 1 day)

(2) Degree of flood :

(i) Average stand. water depth : - m

(ii) Average duration : - days

## III. MAIN CONSTRAINTS OF THE AREA

- (#) Lack of irrigation water supply
- ( ) Suffered by seasonal river flooding
- ( ) Pest and diseases
- ( ) Poor drainability
- (#) Others, if any ; Deterioration of existing facilities

## IV. PROPOSED DEVELOPMENT PLAN

## 4.1 Agricultural Development Plan

## (1) Land use plan

(unit: ha)

Present land use	Land Use Plan				Total
	Net Irrigated Sawah	Net Rainfed Sawah	Oil Palm	Others*	
Irr. Sawah	1,040	-	-	115	1,155
Rainfed Sawah	6,160	-	-	1,385	7,540
Swamp	-	-	-	-	0
Others	0	-	-	0	0
<b>Total</b>	<b>7,200</b>			<b>1,500</b>	<b>8,700</b>

\* Others includes canals, roads, house yard, etc.

(2) Cropping pattern : Double Crop of Paddy

(3) Cropping intensity : 170 %

(4) Target yield

(i) Wet season paddy : 5.0 ton/ha  
(ii) Dry season paddy : 5.0 ton/ha  
(iii) Other crop : - ton/ha

## 4.2 Related development plan

(1) Development plan of DPU in Pelita V  
- Non -

(2) Transmigration program  
(i) Objective area : Non  
(ii) Numbers of transmigrates; Non persons

(3) River improvement works  
- Non -

## 4.3 Proposed Project Works

## (1) Principal Features of Project Works

## (i) Irrigation system

- Water source development
- Diversion structure
- Irrigation canals

Each River

Each Existing Intake

(ii) Drainage canals	New: 177 km,	Improved: 29 km
(iii) Flood protection dike	New: 128 km,	Improved: 24 km
(iv) Farm road	New: 0 km,	Improved: 0 km
(v) On-farm facilities	New: 305 km,	Improved: 53 km
(vi) Land reclamation	7,200 ha	0 ha

( ) Others; \_\_\_\_\_

## V. PROJECT COST ESTIMATE (FINANCIAL COST)

5.1 Land and Compensation Cost	Rp.	1,830 million	145 per US\$/ha
5.2 Survey and Design Costs (5 % of Item 5.3 (1))	Rp.	2,560 million	202 per US\$/ha
5.3 Construction Cost			
		TOTAL IRRRI, NET ARI	7,150 HA
(1) Direct construction cost			
(i) Irrigation and drainage facilities	Rp.	42,800 million	3,382 per US\$/ha
(ii) On-farm and land reclamation	Rp.	8,400 million	664 per US\$/ha
Sub-total (1)	Rp.	51,200 million	4,046 per US\$/ha
(2) Physical contingency (30 % of Item (1))	Rp.	15,360 million	1,214 per US\$/ha
(3) Sub-total of Items (1)+(2)	Rp.	66,560 million	5,259 per US\$/ha
(4) Tax on Civil Works(VAT) (10 % of Item 5.3-(3))	Rp.	6,656 million	526 per US\$/ha
Total of Item 5.3	Rp.	66,560 million	5,259 per US\$/ha
5.4 Cost of the Consultants Services (10 % of total cost of Item 5.3-(1))	Rp.	5,120 million	405 per US\$/ha
5.5 Administration Cost of the Government (1 % of total cost of Item 5.3)	Rp.	666 million	53 per US\$/ha
5.6 Price contingency	Rp.	0 million	0 per US\$/ha
5.7 Total Cost of the Project	Rp.	76,736 million	6,063 per US\$/ha

## VI. IMPLEMENTATION SCHEDULE

6.1 Survey and design	2 Years
6.2 Construction schedule	4 Years
6.3 Executing agency	DGWRD-DPU

## VII. PROJECT EVALUATION

7.1 Project Economic Cost	Rp.	59,520 million
7.2 Project Annual Economic Benefit		
(1) Irrigation development	Rp.	7,450 million
(2) Flood protection works	Rp.	0 million
7.3 Economic viability		
	EIRR:	11.5 %
	B/C :	1.03 (at 10 %)





